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THE

SILVA OF NORTH AMERICA

A DESCRIPTION OF THE TREES WHICH GROW NATURALLY IN NORTH AMERICA EXCLUSIVE OF MEXICO

BY

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Illustrated with Figures and Analyses drawn from Nature

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VOLUME III.

ANACARDIACEÆ—LEGUMINOSÆ

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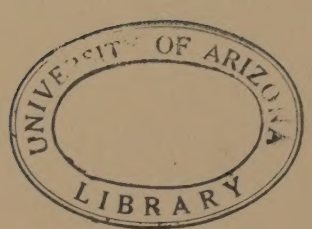

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To

FRANCIS PARKMAN,

WHOSE WORDS HAVE BEST PAINTED THE BEAUTIES OF

THE AMERICAN FOREST,

HIS FRIEND DEDICATES

This Volume.

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SYNOPSIS OF THE ORDERS OF PLANTS CONTAINED IN VOLUME III. OF THE SILVA OF NORTH AMERICA.

CLASS I. **DICOTYLEDONOUS or EXOGENOUS PLANTS.**

Stems increasing in diameter by the annual addition of a layer of wood inside the bark. Leaves netted-veined. Embryo with a pair of opposite cotyledons.

SUB-CLASS I. **Angiospermæ.** Pistil, a closed ovary containing the ovules and developing into the fruit.

DIVISION I. **Polypetalæ.** Flowers with calyx and corolla, the latter divided into separate petals.

B. DISCIFLORÆ. Sepals generally distinct. Stamens as many as the petals, or twice as many, or fewer, usually inserted on a hypogynous or perigynous disk. Ovary superior, many-celled.

18. **Anacardiaceæ.** Flowers usually polygamo-dicœcious. Disk coherent with the base of the calyx. Sepals and petals imbricated in æstivation. Stamens usually as many as the petals and alternate with them, or twice as many, inserted above or around the disk. Ovary 1-celled, the style 2 or 3-lobed, or 2 to 5-celled. Ovule solitary, suspended from the base of the cell on a slender funicle, or attached to the apex or to a parietal placenta. Seed exalbuminous or rarely albuminous. Leaves alternate or rarely opposite, stipular or exstipular.

C. CALYCIFLORÆ. Sepals rarely distinct. Disk adnate to the base of the calyx, rarely tumid or conspicuous or wanting (Mimosæ). Petals usually as many as the lobes of the calyx, or fewer by abortion, inserted on the margin of the calyx-tube or of the disk, occasionally wanting. Stamens definite or indefinite, perigynous or hypogynous. Ovary superior.

19. **Leguminosæ.** Flowers regular or irregular. Stamens definite, monadelphous or diadelphous, or indefinite. Ovary composed of a single carpel. Ovules indefinite or 1 to 2, inserted on the interior angle, amphitropous or anatropous. Style terminal. Albumen often wanting. Leaves usually compound, stipular or exstipular.

SILVA OF NORTH AMERICA.

COTINUS.

FLOWERS regular, dicœcious by abortion or rarely polygamo-dicœcious; calyx 5-lobed, the lobes imbricated in æstivation; petals 5, imbricated in æstivation; ovary 1-celled, obovate, compressed; ovule solitary, suspended from the base of the cell. Fruit an oblong oblique compressed drupe. Leaves simple. Abortive pedicels long and tomentose at maturity.

Cotinus, Linnæus, *Gen.* 84. — Adanson, *Fam. Pl.* ii. 345.
Rhus, Linnæus, *Gen.* ed. 5, 129 (in part). — A. L. de Jussieu, *Gen.* 369 (in part). — Endlicher, *Gen.* 1130 (in part). — Meisner, *Gen.* 74 (in part). — Gray, *Gen. Ill.* ii. 157 (in part). — Bentham & Hooker, *Gen.* i. 418 (in part). — Marchand, *Rev. Anacard.* 179 (in part). — Baillon, *Hist. Pl.* v. 321 (in part).

Small trees or shrubs, with scaly bark, stout terete pithy branches, minute acuminate winter-buds, fleshy roots, and strong-smelling resinous juice.[1] Leaves alternate, petiolate, oval, obovate-oblong or nearly orbicular, glabrous or more or less pilose-pubescent, destitute of stipules, deciduous. Flowers minute, greenish yellow, in ample loose terminal or lateral pyramidal or thyrsoidal panicles, the branches from the axils of linear acute or spatulate deciduous bracts. Pedicels slender, accrescent after the flowering period, mostly abortive and then conspicuously tomentose-villose at maturity. Calyx-lobes ovate, lanceolate, obtuse, persistent. Disk fleshy, annular, slightly five-lobed, coherent with the base of the calyx, and surrounding the base of the ovary. Petals oblong, acute, twice as long as the calyx, inserted under the free margin of the disk opposite its lobes, deciduous. Stamens five, inserted under the margin of the disk, alternate with and shorter than the petals; filaments filiform; anthers broadly ovate, attached on the back below the middle, two-celled, the cells opening longitudinally; usually rudimentary or abortive in the pistillate flower. Ovary sessile, obovate; rudimentary in the pistillate flower. Styles three, short and spreading from the lateral apex of the ovary; stigmas large, terminal, obtuse; ovule anatropous, resupinate-suspended from the apex of a long slender funicle rising from the base of the cell; the micropyle superior. Fruit glabrous, conspicuously reticulate-veined, bearing on the side near the middle the remnants of the persistent styles; sarcocarp thin and dry, the endocarp thick and bony. Seed destitute of albumen, amphitropous; testa thin, membranaceous. Embryo filling the seed; cotyledons oval, flat, accumbent; radicle short, incurved towards the hilum, descending by the unequal development of the fruit.

The genus Cotinus occurs in the three continents of the northern hemisphere. The type of the

[1] The juice of the Old World species of Cotinus is said by Cornevin to possess, although in a slighter degree, the irritating properties found in some American species of Rhus. (*Des Plantes Vénéneuses*, 278.)

genus, *Cotinus Cotinus*,[1] a small shrubby tree, is widely distributed through southern Europe, the Orient, Cashmere, the western subtropical Himalayas, and northern China; and a second species very like the first inhabits a few isolated localities in North America.[2]

The heartwood of the Old World Cotinus is orange-colored and often handsomely marked and mottled, and is valued in southern Europe by cabinet-makers; it furnishes a yellow dye, and under the name of Young Mastic or Venetian Sumach was once an article of commercial importance. The bark is aromatic and astringent, and is used as a tonic and febrifuge; and the bark and leaves, which are rich in tannin, are employed in curing leather.[3] In the Himalayas the branches are used in making baskets and as tooth-sticks.[4]

The Venetian Sumach or Smoke-tree, as the Old World species is commonly called, has been cultivated as a garden-plant[5] from early times for the handsome effect produced by the clusters of long brightly colored pedicels; and varieties have appeared with pendulous branches and with deeper colored pedicels than usually occur on the wild plant.

The genus, from Κότινος, the classical name of a tree with red wood, was established by Tournefort,[6] and was afterwards adopted by Linnæus.

[1] *Cotinus Cotinus*, Sargent, *Garden and Forest*, iv. 340.

Rhus Cotinus, Linnæus, *Spec.* 267. — Pallas, *Voyages*, v. 221, t. 10. — Jacquin, *Fl. Austr.* iii. 6, t. 210. — Boissier, *Fl. Orient.* ii. 4. — Hooker f. *Fl. Brit. Ind.* ii. 9. — Hemsley, *Jour. Linn. Soc.* xxiii. 146.

Cotinus Coggygria, Scopoli, *Fl. Carn.* i. 220. — Engler, *De Candolle Monogr. Phaner.* iv. 350.

[2] Traces of Cotinus appear in the recent Eocene flora of Aix, in which Saporta finds the prototypic form of the existing Old World species (Saporta, *Ann. Sci. Nat.* ser. 4. xvii. 278, t. 13, f. 1; *Origine Paléontologique des Arbres*, 299).

[3] Le Maout & Decaisne, *Traité Gen. Bot.* Eng. ed. 363. — Baillon, *Hist. Pl.* v. 300. — Guibourt, *Hist. Drog.* ed. 7, iii. 490. — Aitchison, *Jour. Linn. Soc.* xix. 141.

[4] Brandis, *Forest Fl. Brit. Ind.* 118. — Gamble, *Man. Indian Timbers*, 104.

[5] Pliny, xvi. 18, 30. — Duhamel, *Traité des Arbres*, i. 191, t. 78. — Loudon, *Arb. Brit.* ii. 549, f. 223.

[6] *Inst.* 610, t. 380.

COTINUS AMERICANUS.

Chittam Wood.

PANICLES slender, long-branched, few-flowered. Leaves obovate or oval, puberulous on the lower surface.

Cotinus Americanus, Nuttall, *Sylva*, iii. 1, t. 81. — Sargent, *Garden and Forest*, iv. 340.

Rhus cotinoides, Nuttall in herb. — Cooper, *Smithsonian Rep.* 1858, 250. — Chapman, *Fl.* 70. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 67 (*Man. Pl. W. Texas*).

Rhus Cotinus (?), Torrey & Gray, *Fl. N. Am.* i. 216.

C. Coggygria, Engler, *De Candolle Monogr. Phaner.* iv. 350 (in part).

A small tree, twenty-five to thirty-five feet in height, with a straight trunk occasionally twelve or fourteen inches in diameter, usually dividing, twelve or fourteen feet from the ground, into several erect stems which separate into wide-spreading, often slightly pendulous branches. The bark of the trunk is an eighth of an inch thick and is light gray and furrowed, the surface breaking into thin oblong scales. The inner bark is white, but on its exposure to the air soon turns orange, and when cut exudes a resinous sap with a strong disagreeable odor. The young shoots are purple at first, but soon become green; during the first winter they are bright red-brown and are covered with small white lenticular spots and marked by large prominent leaf-scars; in their second year the bark of the branches is dark orange-colored. The winter-buds are acuminate and an eighth of an inch long, and are covered with thin dark red-brown scales. The leaves are oval or obovate, rounded or sometimes slightly emarginate at the apex, and gradually contracted at the base; they are thin and membranaceous, entire, with slightly wavy and revolute margins, four to six inches long and two to three inches broad, and are borne on stout petioles varying from a half to three quarters of an inch in length. The leaves are light purple when they unfold and are then covered on the lower surface with fine silky white hairs; they soon turn bright green, and at maturity are dark green above and pale on the lower surface, which is puberulous along the broad midribs and primary veins. The flowers, which appear late in April or early in May, are produced in puberulous terminal panicles five or six inches long and two and a half to three inches broad, the males and females on different individuals. The bracts are scarious, half an inch long, and early deciduous. The flower-bearing pedicels are from a half to three quarters of an inch in length and are usually collected three or four together in loose umbels near the ends of the principal branches of the panicles. The ripe fruit, which is produced very sparingly, is rather more than an eighth of an inch long, and is borne on stalks which vary in length from two to three inches. The sterile pedicels are from one and a half to two inches long at maturity, and are covered with short, not very abundant, and rather inconspicuous pale purple or brown hairs.

Cotinus Americanus was discovered by Thomas Nuttall in 1819 on the banks of Grand River, a tributary of the Arkansas, within the present limits of the Indian Territory;[1] twenty-three years later it was found by Mr. S. B. Buckley[2] in Alabama, where it grows in a few localities north of

[1] *A Journal of Travels into the Arkansas Territory during the Year* 1819, 177.

[2] Samuel Botsford Buckley (1809–1884) was a native of Yates County, New York, and was educated at Wesleyan University, Middletown, Connecticut, where he was graduated in 1836. He established himself as a teacher first in Illinois and then in Alabama, and was one of the earliest naturalists to explore the southwestern regions of the Apalachian-mountain system, where he discovered many interesting plants. In 1866 Buckley was appointed state geologist of Texas, and made his home in Austin, where he resided during the remainder of his life. In Texas he continued his botanical studies and found many undescribed plants. The botanical papers which contained the results of these investigations were prepared without access to a well-equipped library,

the Tennessee River on the southern slopes of the Cumberland Mountains in the neighborhood of Huntsville;[1] it occurs on the Cheat Mountains in eastern Tennessee and in the valley of the Medina River in western Texas.[2] In Alabama *Cotinus Americanus* occupies limestone terraces at elevations of seven hundred to nine hundred feet above the level of the sea, on the steep and rocky slopes of mountains covered with a heavy forest growth of Chestnut Oaks, Elms, Mocker Nuts, Black Maples, and Junipers, and a dense undergrowth composed of the Black Haw, the Wild Plum, the Hornbeam, and the fragrant Sumach. It is nowhere abundant, and occurs only in small isolated groves or thickets scattered along the sides of rocky ravines.

The wood of *Cotinus Americanus* is light, soft, and rather coarse-grained, the layers of annual growth being marked by several rows of large open ducts; it is a bright clear rich orange-color with thin nearly white sapwood, and contains numerous very obscure medullary rays. It is very durable in contact with the soil, but is difficult to season and liable to check in drying. The specific gravity of the absolutely dry wood is 0.6425, a cubic foot weighing 40.04 pounds. It yields a clear orange-colored dye, and was once largely used locally for fence-posts.

Cotinus Americanus was introduced into cultivation through the Arnold Arboretum in 1882. It has not proved hardy in New England, and is not known to have flowered in cultivation. In favorable situations it may be expected to grow to a larger size than the Venetian Sumach. The sterile filaments are shorter, less abundant, and less brightly colored, and it will probably prove a less showy and desirable garden plant.[3]

and brought severe and not always just criticisms upon their author. The last years of his life, devoted principally to farming and fruit-growing, were thus greatly embittered, although his interest in botany survived to the end. *Buckleya*, a remarkable Santalaceous genus, of which he discovered the flowers and fruit, and which is represented in the flora of America by a graceful shrub of the mountains of North Carolina, and in Japan by a second species peculiar to that country, fitly commemorates Buckley's zealous and too little appreciated labors in the cause of science.

[1] The most accessible locality where this tree is found in Alabama is on the slopes and summit of a low hill near Bailey's farm, twelve miles from Huntsville, on the road to Winchester, Tennessee. (Buckley, *Proc. Phil. Acad.* 1881, 125.) It was also found by Mohr on the southern slope of Mt. Sono, east of Huntsville. (*Proc. Phil. Acad.* 1882, 217.) During the War of Secession nearly all the large specimens were cut down for the dye which the wood yields, and the tree is now much less common than formerly and is in danger of extermination.

[2] *Cotinus Americanus* was discovered in Texas on the 6th of June, 1885, by Mr. Julien Reverchon on the steep bluffs of the narrow defile of the Bandera Pass over which the road from Kerrsville to Bandera crosses; and also five miles west of Bandera on the Waresville road. Only a few shrubby individuals were found in these two stations.

[3] The fruiting panicles of the Venetian Sumach as it now appears in gardens have been greatly modified by long cultivation and by selection with a view to developing their showy appearance, and are much more conspicuous than those of the wild plant. Cultivation and selection may be expected to produce similar changes in the American plant.

EXPLANATION OF THE PLATES.

Plate XCVIII. Cotinus Americanus.

1. A flowering branch of the staminate plant, natural size.
2. A flowering branch of the pistillate plant, natural size.
3. Diagram of a flower.
4. A staminate flower, enlarged.
5. Vertical section of a staminate flower, enlarged.
6. Front and rear view of a stamen, enlarged.
7. A pistillate flower, enlarged.
8. Vertical section of a pistillate flower, enlarged.
9. A pistil cut transversely, enlarged.
10. An ovule, much magnified.

Plate XCIX. Cotinus Americanus.

1. A fruiting branch, natural size.
2. A fruit, enlarged.
3. Vertical section of a fruit, enlarged.
4. Cross section of a fruit, enlarged.
5. A seed, enlarged.
6. An embryo, much magnified.
7. A winter branchlet, natural size.

C. E. Faxon del

Picart fr sc

COTINUS AMERICANUS, Nutt.

A. Riocreux dirext.

Imp. R. Taneur, Paris.

C.E. Faxon del.

Picart fr. sc.

COTINUS AMERICANUS, Nutt.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

RHUS.

FLOWERS regular, polygamo-diœcious, polygamo-monœcious or diœcious by abortion; calyx 5-lobed, the lobes imbricated in æstivation; petals 5, imbricated in æstivation; ovary 1-celled, ovoid or globular; ovules solitary, suspended. Fruit, a small nut-like drupe.

Rhus, Linnæus, *Gen.* 84. — Adanson, *Fam. Pl.* ii. 342. — A. L. de Jussieu, *Gen.* 369 (excl. *Cotinus*). — Endlicher, *Gen.* 1130 (excl. *Cotinus*). — Meisner, *Gen.* 74 (excl. *Cotinus*). — Gray, *Gen. Ill.* ii. 157 (excl. *Cotinus*). — Bentham & Hooker, *Gen.* i. 418 (excl. *Cotinus*, *Lithræa*, and *Anaphrenium*). — Marchand, *Rev. Anacard.* 179 (excl. *Cotinus* and *Anaphrenium*). — Baillon, *Hist. Pl.* v. 321 (excl. *Cotinus*, *Lithræa*, and *Anaphrenium*).

Metopium, Browne, *Nat. Hist. Jam.* 177.

Vernix, Adanson, *Fam. Pl.* ii. 342.

Pocophorum, Necker, *Elem. Bot.* ii. 226.

Lobadium, Rafinesque, *Jour. Phys.* lxxxix. 98.

Turpinia, Rafinesque, *N. Y. Med. Rep.* hex. 2, v. 352.

Schmalzia, Desvaux, *Jour. Bot.* iii. 229.

Styphonia, Nuttall; Torrey & Gray, *Fl. N. Am.* i. 220.

Melanococca, Blume, *Mus. Lugd. Bat.* i. 236.

Trees or shrubs, sometimes climbing by rootlets, with stout terete pithy branchlets, fleshy roots, and resinous or viscid milky, sometimes caustic, juice. Leaves alternate, pinnate, pinnately trifoliate or rarely simple, destitute of stipules. Flowers minute, white or greenish white, in more or less compound axillary or terminal panicles, the males and females usually produced on separate plants. Calyx five-lobed, the lobes united at the base only, generally persistent. Disk fleshy, surrounding the base of the free ovary, coherent with the base of the calyx, annular or five-lobed. Petals five, longer than and alternate with the divisions of the calyx, inserted under the margin of the disk opposite its lobes, deciduous. Stamens five, inserted on the margin of the disk, alternate with the petals; filaments subulate; anthers oblong, attached on the back, introrse, two-celled, the cells opening longitudinally; rudimentary or abortive in the pistillate flower. Ovary one-celled, sessile, ovoid or subglobose; rudimentary in the staminate flower; styles three, terminal, free or slightly connate at the base, rising from the centre of the ovary and crowned with the obtuse or capitate stigmas; ovule solitary, anatropous, suspended from the incurved apex of a slender funiculus rising from the base of the cell; the micropyle superior. Fruit usually globose, rarely compressed or ovoid, smooth or covered with hairs; sarcocarp thin and dry, more or less resinous; endocarp crustaceous or bony. Seed ovoid or reniform, amphitropous, commonly transverse, filling the cavity of the fruit, destitute of albumen; testa thin, membranaceous. Embryo filling the seed; cotyledons flat, foliaceous, generally transverse; radicle long, uncinate, laterally accumbent.

Rhus is widely distributed in the extratropical regions of the northern and southern hemispheres, but is rare within the tropics. More than a hundred species are distinguished;[1] they abound in southern Africa,[2] North America, and eastern and southern Asia,[3] and are found in tropical and subtropical America[4] and the Andes,[5] in east tropical Africa,[6] in the Indian Archipelago,[7] the Fejee[8] and Hawaiian Islands,[9] and in Australia[10] where one species is known. Traces of Rhus are rare and

[1] Engler, *De Candolle Monogr. Phaner.* iv. 371.

[2] Harvey & Sonder, *Fl. Cap.* i. 504.

[3] Franchet & Savatier, *Enum. Pl. Jap.* i. 92. — Hemsley, *Jour. Linn. Soc.* xxiii. 146. — Hooker f. *Fl. Brit. Ind.* ii. 9.

[4] Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vii. 8, t. 602–604. — Grisebach, *Fl. Brit. W. Ind.* 175. — Triana & Planchon, *Ann. Sci. Nat.* ser. 5, xiv. 288. — Hemsley, *Bot. Biol. Am. Cent.* i. 217.

[5] Ruiz & Pavon, *Fl. Peruv.* iii. 29, t. 252. — Engler, *l. c.* 400.

[6] Richard, *Fl. Abyss.* i. 143. — Oliver, *Fl. Trop. Afr.* i. 436. — Engler, *l. c.* 441.

[7] Blume, *Bijdr. Fl. Ned. Ind.* 1164. — Miquel, *Fl. Ind. Bat.* i. pt. ii. 621. — Engler, *l. c.* 450.

[8] Gray, *Bot. Wilkes Explor. Exped.* 367, t. 44.

[9] Hillebrand, *Fl. Haw. Is.* 89.

[10] Bentham, *Fl. Austral.* i. 488.

faintly characterized in the records of the Tertiary Arctic flora; they abound, however, in that of Europe, especially from the late Eocene to the end of the Miocene period.[1] In North America the genus is widely and generally distributed from Canada to southern Mexico, and from the shores of the Atlantic to those of the Pacific Ocean, with sixteen or seventeen species within the territory of the United States. Five species growing north of Mexico reach the size and attain the habit of small trees; the others are large or small shrubs.

Many species of Rhus possess useful properties, and some of them are of commercial importance. The most valuable is the Lacquer-tree of China and Japan, *Rhus vernicifera*.[2] The acrid milky poisonous juice[3] of this species furnishes the black varnish used by the Japanese in the manufacture of lacquer;[4] and a wax is obtained from the fruit and from that of *Rhus succedanea*,[5] a native of

[1] Saporta, *Origine Paléontologique des Arbres*, 298.

[2] De Candolle, *Prodr.* ii. 68. — Franchet & Savatier, *Enum. Pl. Jap.* i. 93. — Engler, *De Candolle Monogr. Phaner.* iv. 398. — Hemsley, *Jour. Linn. Soc.* xxiii. 148.

R. Vernix, Thunberg, *Fl. Jap.* 121 (not Linnæus).

[3] *Arbor vernicifera legitima, folio pinnato Juglandis, fructu racemoso ciceris facie*, Kaempfer, *Amœn.* 791, t. Kaempfer alludes to the poisonous properties of the juices of this plant in the following passage: "Utrinque Japonica & Siamensis Vernix venenatum exspirat halitum, ex quo labia tumescunt, & caput dolet; unde in deliniendo artifices strophiolo os & nares obligant." 794.

[4] The manufacture of lacquer-ware has been practiced in Japan for more than two thousand years. The principal ingredient used is the sap of the Lacquer-tree, which is cultivated with more or less care all over the main island of Nippon and is grown in several districts of the islands of Kiushiu and Shikoku, although a temperate climate appears to suit it best, as it reaches its greatest perfection on the main island north of latitude 36°. It is cultivated principally in northern Hondo, between latitude 37° and 39°; but extensive plantations occur also in the valley of the Tadami-gawa and in northern Echigo. Here villages are embowered in groves of Lacquer-trees, which grow up with straight trunks and while young produce handsome heads of large pinnate leaves, said by Rein to exceed those of all other species of Rhus in size and beauty. Old trees produce comparatively few branches, and their foliage is light and thin.

The Lacquer-tree is propagated from seed and by cuttings. The fruit is gathered in October, and the outer covering of the stones is at once removed by pounding them in mortars. They are then washed and put into straw sacks, which are plunged in liquid manure or in water during the winter. In the early spring, having been first exposed to the sun for five or six days, they are sown in carefully prepared seed-beds, and covered with a thin layer of soil. The seedling plants reach a height of ten or twelve inches during the first summer, and the following spring are transplanted six feet apart and allowed to grow undisturbed. In ten years they attain an average height of nine or ten feet, with trunks two or three inches in diameter. Plants raised from root-cuttings grow rather more rapidly than seedlings, although the latter make hardier and longer-lived trees. The process is simple and demands little labor or skill. Pieces of the root about half an inch thick are taken from vigorous young trees and are cut into six-inch lengths; these are set in beds in a slanting position, about an inch only being left above the surface of the soil. These cuttings, which are usually planted in March, produce shoots nearly two feet long during the first season, and the following spring are transplanted in the same manner as the seedlings. Once planted, the trees receive little subsequent care, although they repay the cost of occasional manuring by a more luxuriant growth. The increased demand for cereals and other farm produce which has sprung up in Japan of late years has restricted the planting of the Lacquer-tree to hilly and waste grounds, and old plantations bordering arable fields are being destroyed to make room for more valuable crops.

The age at which the trees are tapped varies in different provinces. Sometimes they are tapped when only four years old, although nearly all cultivated trees are allowed to grow for at least ten years before the sap is drawn from them, when they yield from two to three ounces each. Very old trees are supposed to produce the best and strongest lacquer, and the sap from such trees is therefore collected separately and brings a high price.

The operation of drawing the sap from the trees lasts from June until November. A number of short horizontal incisions, one above the other and about six inches apart, are made in the trunk and main branches. From these the sap is collected several times a day with a wooden tool made for the purpose, while every three or four days a sharp knife-blade is run under the bark, along the edges of the cuts, to insure a free flow. Finally all the branches are cut off the tree, and the larger ones are tapped again to extract any sap that may still remain in them, while the small ones which have not been tapped are tied in bundles and steeped in water for several days, when they yield a small amount of sap.

This operation kills the tree in one season. By reducing the number of incisions it is sometimes allowed to live through another season; but the sap then obtained is of inferior quality and trees are rarely worked more than one year. Usually contractors purchase the trees by the thousand, and the sap is extracted as rapidly and as thoroughly as possible by professional tappers. As soon as it is drawn it is poured into large wooden tubs or vats, and is stirred in the sun with large wooden spatulas until all excess of water is evaporated. In some cases it undergoes careful straining; in others it is mixed with sulphate of iron, oxide of iron, or with indigo. A skillful workman is expected to work on an average a thousand trees in a season; and some idea of the extent of the industry may be obtained from the fact that the Province of Echizen sends out fifteen hundred tappers every year to the different lacquer districts of the Empire. From 30,000 to 35,000 tubs of lacquer varnish, each of four gallons capacity, are annually produced in the country. (See J. J. Quin, *Trans. Asiatic Soc. Jap.* ix. pt. i. 1; British Consular Reports, 1882. — Audsley, *Ornamental Arts of Japan*, i. sec. 4, 3. — Louis Gonse, *L'Art Japonais*, 246. — Maeda, *La Revue Scientifique*, ser. 2, xiv. 1178. — Reed, *Japan, its History, Traditions, and Religions*, ii. 31. — Rein, *Japan nach Reisen und Studien im Auftrage der Königlich Preussischen Regierung*, ii. 186. — Hosie, *Three Years in Western China*, 164.)

[5] The vegetable-wax of Japan is obtained from the thick white coating of the seeds of *Rhus vernicifera* and of *Rhus succedanea*.

southern and eastern Asia. Chinese galls[1] are produced on *Rhus semialata*, a tree widely distributed from the Himalayas through China and Japan to the Hawaiian Islands. *Rhus Coriaria*[2] is cultivated in southern Europe for the tannin contained in its leaves, which, dried and pulverized, are used in curing leather;[3] the acid and astringent fruit was employed by the ancients as a condiment, and is still occasionally used.[4] The wood of many of the species is soft, coarse-grained, and highly colored; others yield hard and heavy wood valued in cabinet-making and for wagons. The acrid and astringent berries of *Rhus glabra*,[5] a shrubby North American species, are diuretic and refrigerant, and are sometimes used, in infusion, in the treatment of catarrhal troubles and in febrile diseases; and an infusion of the leaves and of the inner bark of the roots is employed for the same purpose and in dressing wounds.[6] The leaves of the so-called Poison Ivy of North America and Japan, *Rhus Toxicodendron*,[7] are stimulant and narcotic and are said to have been successfully used in the treatment

This tree is widely distributed in several forms from the Himalayas to Java and Japan, and is extensively grown in the milder portions of Japan, flourishing south of latitude 35° north, and in Kiushiu and some parts of Ino, forming a conspicuous feature of the landscape, covering hillsides and lining the borders of fields and roads and the margins of dikes and canals. It is a smaller and more widely branching tree than *Rhus vernicifera*, with smaller leaves but larger, heavier fruit richer in fat; it resembles an Apple-tree in habit, and grows to a height of fifteen or eighteen feet. As the Wax-tree is cultivated for its fruit alone, it is usually propagated from cuttings in order to secure a preponderance of female plants, the methods adopted for multiplying the Lacquer-tree being used. It increases in productiveness with age, and the ground is therefore generally more carefully prepared and enriched for it than for the Lacquer-trees, which are constantly destroyed and replanted.

The fruit of both these trees is kidney-shaped and light yellow-green when ripe. The semitranslucent outer coat separates and falls soon after the fruit reaches maturity, leaving the greenish white fat of the mesocarp visible. As soon as it is gathered the fruit is separated from the stalks and is ground; the meal is then put into hempen sacks, heated by steam, and pressed in wedge-shaped presses. The tallow as it flows from the press soon congeals into a solid mass. This is melted in iron kettles to free it from impurities, and the wax as it rises is skimmed off into small earthenware saucers, from which it can be easily removed in cakes ready for the market. The wax intended for export is made almost entirely from the fruit of *R. succedanea* and undergoes a process of bleaching. The raw wax is melted and allowed to drop through woolen bags into cold water; it is then placed in shallow boxes and exposed to the sun, and, being frequently sprinkled with water and turned, in thirty days becomes white and almost odorless. Rhus-tallow, which is not a true wax, is composed of a mixture of several glycerides, principally of palmitic acid. The Japanese use it for candles and in the place of beeswax in polishing furniture. It is exported in considerable quantities, principally to Great Britain and the United States, and is mixed with beeswax or used as a substitute for it. (See A. Mayer, *Archiv. de Pharmacie*, xii. 2, 1879. — Buri, *Archiv. de Pharmacie*, xii. 5. — Rein, *l. c.* 189.)

[1] Chinese galls are vesicular excrescences produced on the branches and leaf-stalks of *Rhus semialata* (Murray, *Goett. Verh.* 1784, 27, t. 3. — De Candolle, *Prodr.* ii. 67. — Hooker f. *Fl. Brit. Ind.* ii. 10. — Brandis, *Forest Fl. Brit. Ind.* 119. — Franchet & Savatier, *Enum. Pl. Jap.* i. 92. — Engler, *De Candolle Monogr. Phaner.* iv. 380. — Hillebrand, *Fl. Haw. Is.* 89. — Hemsley, *Jour. Linn. Soc.* xxiii. 146) by the punctures of an insect believed to be *Aphis Chinensis*. The galls are light and hollow and vary in length from one to two and a half inches; they contain about seventy per cent. of tannic acid, which is regarded identical with that obtained from oak galls. Chinese galls appear to have been first imported into Europe early in the eighteenth century, when they were known as "Oreilles des Indes" (Geoffrey, *Mém. Acad. Royale des Sciences*, 1724, 324), but they soon disappeared from commerce, and it is only in recent years that they have formed a regular article of trade, being imported from both China and Japan into Europe, where they are used, principally in Germany, in the manufacture of tannic and gallic acids. (Flückiger & Hanbury, *Pharmacographia*, 538.)

[2] Linnæus, *Spec.* 265. — De Candolle, *Prodr.* ii. 67. — Sibthorp, *Fl. Græc.* iii. 84, t. 290. — Ledebour, *Fl. Ross.* i. 509. — Boissier, *Fl. Orient.* ii. 4. — Engler, *De Candolle Monogr. Phaner.* iv. 381.

[3] *Rhus Coriaria*, which is a small shrubby tree, grows naturally on dry rocky slopes and on gravelly sterile plains, and is widely distributed through the regions bordering the Mediterranean and the Black Sea, extending into the Caucasus, to the shores of the Caspian and to northern Persia, and to Madeira and the Canary Islands.

The sumach of commerce, used in curing the best qualities of leather, consists of the dried and powdered leaves of this plant, which has long been cultivated on a large scale in southern Europe, particularly in Italy, Spain, and Portugal. Dry calcareous soil from which the water drains rapidly produces the most valuable sumach. The plants are propagated by suckers, which are set in December and January and yield a harvest of leaves the first year. They are carefully cultivated and are severely pruned at the beginning of winter to encourage the production of vigorous shoots and a large crop of leaves. A plantation is usually profitable for twelve or fifteen years, and is then dug up and renewed. The leaves are gathered in June, and are threshed and ground into fine powder, in which form sumach appears in commerce. It is bright olive-green and contains from twenty-five to thirty per cent. of tannic acid identical with that found in Oak galls. (For a detailed account of the method of cultivating *Rhus Coriaria* in Sicily, see a paper by Professor Inzenga in the *Annali di Agricultura Siciliana*, 1852, reproduced in the *Trans. Bot. Soc. Edinburgh*, ix. 341. See also *U. S. Consular Reports*, No. 42, June, 1884, 27. — Naudin, *Manuel de l'Acclimateur*, 462.)

[4] A. de Candolle, *L'Origine des Plantes Cultivées*, 106.

[5] Linnæus, *Spec.* 265. — Engler, *De Candolle Monogr. Phaner.* iv. 376. — Watson & Coulter, *Gray's Man.* ed. 6, 119.

[6] Stillé & Maisch, *Nat. Dispens.* ed. 2, 1230. — *U. S. Dispens.* ed. 14, 772. — Parke, Davis & Co., *Organic Mat. Med.* 174.

[7] Linnæus, *Spec.* 266. — Engler, *l. c.* 393. — Watson & Coulter, *l. c.*

of cutaneous diseases. Their medicinal worth, however, is not great.[1] The juice of this plant, which turns black on exposure to the air, may serve as indelible ink; it is soluble in ether.[2] An infusion of the astringent bark of the roots of *Rhus aromatica*,[3] an undershrub widely distributed through the northern states and Canada, is valued as an excitant to the bladder, and in the treatment of hemorrhages and of atonic diarrhœa.[4] The white waxy exudation produced in summer from the fruit of *Rhus obovata*,[5] a shrubby species of the mountains of southern California and the adjacent regions of Mexico, has a sweet and agreeable flavor, and is used by Indians as a substitute for sugar.[6]

Few species of insects[7] are known to injure Rhus in North America; and its diseases caused by fungi[8] are not numerous or particularly serious.

Several species of Rhus, particularly the Sumachs of eastern North America, have long been grown in gardens for the beauty of their fruit and of their foliage which assumes brilliant colors in autumn. The Asiatic *Rhus semialata* is cultivated in the gardens of the United States and Europe for its conspicuous flower-clusters and its large handsome leaves which turn orange and scarlet before falling. *Rhus lucida*,[9] a native of southern Africa, is often employed as a hedge plant in the countries adjacent to the Mediterranean.[10]

The name of the genus, formed from Ῥοῦς, the classical name of the European Sumach, was established by Tournefort[11] and afterwards adopted by Linnæus.

[1] Stillé & Maisch, *Nat. Dispens.* ed. 2, 1436. — *U. S. Dispens.* ed. 14, 906.

[2] The juices of *Rhus Toxicodendron*, and even the effluvium exhaled by it under the influence of a hot sun, are extremely poisonous to some persons, while others are not affected by them and can handle the plant without injury. The effects of the poison, which appear several hours after exposure, are redness and violent itching, followed by fever and a vesicular eruption which may be accompanied, especially on the face and genitals, with tumefaction; they reach their height on the fourth or fifth day, when desquamation begins and the swelling and pain subside. Herbivorous animals are particularly fond of the leaves of *R. Toxicodendron* and devour them greedily and with perfect impunity; and various insects which feed upon them do so, apparently, without injury. (J. C. White, *Dermatitis Venenata*, 31.)

[3] Aiton, *Hort. Kew.* i. 367. — Gray, *Gen. Ill.* ii. 160, t. 160; *Man.* ed. 5, 112.

R. Canadensis, Marshall, *Arbust. Am.* 129. — Watson & Coulter, *Gray's Man.* ed. 6, 119.

[4] Napheys, *Medical Therapeutics*, 467. — Parke, Davis & Co., *Organic Mat. Med.* 154.

[5] Watson, *Proc. Am. Acad.* xx. 358.

Styphonia integrifolia, Torrey, *Pacific R. R. Rep.* vii. pt. iii. 9, t. 2 (in part).

R. integrifolia, Brewer & Watson, *Bot. Cal.* i. 110 (in part).

[6] C. R. Orcutt, *The Western American Scientist*, iii. 46.

[7] The Jumping Sumach-beetle (*Blepharida rhois*, Forster) is one of the most troublesome insects which attack Rhus in North America, often defoliating *R. glabra* and *R. typhina* over large areas of country. (C. V. Riley, *6th Rep. Insects of Mo.* 118.) Caterpillars of various species feed on the leaves, and a leaf-roller (*Loxotænia rosaceana*, Harris) frequently disfigures them. An aphis (*Pemphigus rhois*, Fitch) causes the large conspicuous galls which often appear on the leaves of *R. typhina*, and *Psylla rhois*, Fitch, is sometimes found in great numbers on the different species, especially on *R. copallina*.

[8] Most of the fungi inhabiting Rhus in North America are small species of the order *Discomycetes* found on the stems and less frequently on the leaves. The most conspicuous of these in the northern and eastern parts of the country is *Taphrina purpurascens*, Robinson; it is most abundant on *Rhus copallina*, but also attacks *R. glabra*. The diseased leaves, which are principally near the tips of the branches, may at once be recognized by a dark lurid purple color becoming somewhat glaucous as the spores ripen. The affected leaflets are abnormally swollen and crisp on the upper surface, and finally hang drooping from the branches. The effect produced by this fungus is very unsightly, and might, without the aid of a microscope, pass for the work of insects. *Uromyces brevipes* (B. & Rav.) is found throughout the eastern and central parts of the United States on *R. Toxicodendron* and occurs in California on *R. diversiloba*. *Pileolaria effusa* (Peck), a closely related species, is found on *R. aromatica*, and other related forms afflict different species of Rhus in Japan.

[9] Linnæus, *Spec.* 267. — Cavanilles, *Icon.* ii. 27, t. 132. — Harvey & Sonder, *Fl. Cap.* i. 517. — Engler, *De Candolle Monogr. Phaner.* iv. 413.

[10] Naudin, *Manuel de l'Acclimateur*, 463.

[11] *Inst.* 611, t. 381.

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

METOPIUM. Flowers in axillary panicles; drupe obovate, glabrous; leaves unequally pinnate. (Poisonous.)

Leaves pinnate or often trifoliate . . . . . 1. R. METOPIUM.

SUMAC. Flowers in terminal thyrsoidal panicles; fruit globular, clothed with acrid hairs; leaves unequally pinnate.

Branches and leaf-stalks densely velvety-hairy; leaflets 11 to 31, pale on the lower surface; fruit covered with long hairs . . . . . 2. R. TYPHINA.

Branches and leaf-stalks pubescent; petioles winged; leaflets 9 to 21, green on the lower surface; fruit pilose . . . . . 3. R. COPALLINA.

TOXICODENDRON. Flowers in slender axillary panicles; fruit glabrous, white; leaves unequally pinnate or trifoliate. (Poisonous.)

Leaves pinnate, seven to thirteen-foliolate . . . . . 4. R. VERNIX.

STYPHONIA. Flowers in terminal panicles; pedicels conspicuously bracted; fruit pubescent; leaves usually simple, persistent.

Flowers in short compact panicled racemes; leaves ovate, entire or serrate, simple or rarely trifoliate . . . . . 5. R. INTEGRIFOLIA.

RHUS METOPIUM.

Poison Wood. Hog Gum.

FLOWERS dicœcious by abortion. Drupe obovate, glabrous; stone chartaceous. Leaves unequally pinnate; leaflets glabrous, entire.

Rhus Metopium, Linnæus, *Amœn.* v. 395. — Poiret, *Lam. Dict.* vii. 507. — Titford, *Hort. Bot. Am.* 51. — Descourtilz, *Fl. Med. Antil.* ii. 49, t. 79. — Roemer & Schultes, *Syst.* vi. 648. — De Candolle, *Prodr.* ii. 67. — Don, *Gen. Syst.* ii. 69. — Spach, *Hist. Vég.* ii. 211. — Macfadyen, *Fl. Jam.* 225. — Dietrich, *Syn.* ii. 1002. — Nuttall, *Sylva*, ii. 121, t. 80. — Richard, *Fl. Cub.* ii. 157. — Grisebach, *Fl. Brit. W. Ind.* 175. — Chapman, *Fl.* 69. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 54.

R. Oxymetopium, Grisebach, *Cat. Pl. Cub.* 67.

Metopium Linnæi, Engler, *De Candolle Monogr. Phaner.* iv. 367.

Metopium Linnæi, var. **Oxymetopium**, Engler, *De Candolle Monogr. Phaner.* iv. 367.

A tree, with exceedingly acrid poisonous juices, frequently thirty-five to forty feet in height, with a short trunk sometimes two feet in diameter, and stout spreading often pendulous branches forming a low broad top. The bark of the trunk is an eighth of an inch thick, and separates into large thin plate-like scales displaying the bright orange-color of the inner bark; it is light reddish brown tinged with orange and often marked with dark spots caused by the exuding of the resinous gum with which this tree abounds. The branchlets are thick and are reddish brown, with prominent leaf-scars and numerous orange-colored lenticular excrescences. The winter-buds are large and covered with thick acuminate scales truncate at the apex and furnished on the margin with rufous hairs. The leaves, which are clustered near the ends of the branches, are nine to ten inches long, and are borne on stout petioles with swollen and enlarged bases; they are composed of two or three pairs and a terminal leaflet, or are often three-foliate, and unfold in March, remaining on the branches until the appearance of the new growth the following year. The leaflets are ovate, broadly rounded or usually contracted towards the apex, which is then acute or sometimes slightly emarginate, and rounded or sometimes cordate or wedge-shaped at the base. They are thick, smooth, and lustrous, with thickened slightly revolute margins, prominent midribs, primary veins spreading at right angles, and many reticulating veinlets; they are three or four inches long and two or three inches broad, and are borne on stout petiolules half an inch or an inch in length, that of the terminal leaflet being sometimes twice as long as the others. The male and female flowers are produced on separate trees in slender erect axillary clusters aggregated at the ends of the branches and as long as the leaves or rather longer. The stem of the inflorescence is enlarged at the base, and, like its branches, is covered with small orange-colored lenticular spots. The bracts and bractlets are acute, minute, and deciduous. The pedicels are stout, an eighth of an inch thick, and as long as the obtuse flower-buds. The lobes of the calyx are semiorbicular, with membranaceous margins, and are half the length of the ovate obtuse yellow-green petals, which are marked on the inner surface with dark longitudinal lines. The stamens are rather shorter than the petals in the sterile flower, and are minute and rudimentary in the fertile flower. The ovary, which in the sterile flower is reduced to a small point, is subglobose with a short style and a large three-lobed stigma. The fruit ripens in November and December, and hangs in long graceful clusters; it is obovoid, orange-colored, glabrous and rather lustrous, three quarters of an inch in length, and crowned with the remnants of the style. The outer covering, which is rather thick and resinous, incloses a thin crustaceous stone and a nearly quadrangular thin seed with a broad funicle covering its margin and a smooth dark brown opaque testa.[1]

[1] The juices of *Rhus Metopium*, and even its exhalations at the time the trees are in flower, are exceedingly poisonous to most people, producing the same symptoms as those caused by *Rhus Toxicodendron*.

Rhus Metopium is found in Florida on the shores of Bay Biscayne and on the principal southern keys, where it is one of the commonest and most beautiful of the smaller trees. It also inhabits the Bahamas, Cuba, Jamaica, and Honduras.

The wood of *Rhus Metopium* is heavy and hard, although not strong, and contains many evenly distributed open ducts and thin medullary rays. It is rich dark brown streaked with red, with thick light brown or yellow sapwood composed of twenty-five to thirty layers of annual growth. The specific gravity of the absolutely dry wood is 0.7917, a cubic foot weighing 49.34 pounds. It checks badly in drying and is little used or esteemed. An emetic, purgative, and diuretic resinous gum is obtained from incisions made in the bark.[1]

Rhus Metopium was probably first described by Sloane[2] in his catalogue of the plants of Jamaica published in 1696. It was first discovered in Florida[3] by Dr. J. L. Blodgett.[4]

Metopium, the name used by Pliny[5] for an African tree, was first adopted by Browne as the generic name of this plant.

[1] *Pharmaceutical Journal*, v. 60; vii. 270. — Guibourt, *Hist. Drog.* ed. 7, iii. 489. This resin appears to have been formerly held in some esteem by the inhabitants of Jamaica, where, according to Browne, it was much employed in "strengthening plasters" and was useful in the treatment of "all swellings arising from colds, the weakness of the vessels, or poverty of the juices, both externally and internally." (*Nat. Hist. Jam.* 178.)

[2] *Terebinthus maxima, pinnis paucioribus majoribus atque rotundioribus, fructu racemoso sparso*, 167; *Nat. Hist. Jam.* ii. 90, t. 199.

Toxicodendron foliis alatis fructu purpureo Pyri formi sparso, Catesby, *Nat. Hist. Car.* i. 40, t. 40.

Metopium foliis subrotundis, pinnato-quinatis, racemis alaribus, Browne, *Nat. Hist. Jam.* 177, t. 13, f. 3.

It is possible that the "Poyson Tree," which Richard Ligon could not commend for her virtues, although he could for her beauties, may have been *Rhus Metopium*, although it is not reported as now growing on the Barbadoes. (See *A true and exact History of the Island of Barbados*, by Richard Ligon, Gent., London, 1657, p. 68.)

Samuel Clarke, in *A True and Faithful Account of the Four Chiefest Plantations of the English in America, to wit, of Virginia, New England, Bermudas and Barbados*, published in London in 1670, describes on page 72 a Poison Tree, which is, perhaps, *Rhus Metopium*. This, he says, "is very beautiful, almost as large as the Locust: Her *Leaves* as large and beautiful as *Laurel Leaves*, and very like them. As they cut down these *Trees* they have *Cipers* over their *Faces*: For if any of their Sap flies into their eyes, it makes them blind for a moneth after. Of this Timber they make most of the Vessels wherein they cure their Sugar."

[3] *Rhus Metopium* is called by the inhabitants of the Florida keys Coral Sumach, Mountain Manchineel, Bum Wood, and Doctor Gum, as well as, more commonly, Poison Wood and Hog Gum. This last name, by which the tree was known in Jamaica in Sloane's time, had its origin, he says, in the fact "that wild Hogs, when wounded, by natural Instinct come to this Tree, where by rubbing its Balsam on their Wounds they are cured." (*Nat. Hist. Jam.* ii. 91.) According to Macfadyen, however, the true Hog Gum-tree is *Moronobea coccinea*, Aubley, and not Rhus. (*Fl. Jam.* 225.)

[4] See i. 33.

[5] xii. 23, 49.

EXPLANATION OF THE PLATES.

Plate C. Rhus Metopium.

1. A flowering branch of the staminate tree, natural size.
2. A flowering branch of the pistillate tree, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. Diagram of a flower.

Plate CI. Rhus Metopium.

1. A fruiting branch, natural size.
2. Vertical section of a fruit, enlarged.
3. Cross section of a fruit, enlarged.
4. A seed, enlarged.
5. An embryo, magnified.

C.E. Faxon del. Picart ft. sc.

RHUS METOPIUM, L.

A. Riocreux direx.t Imp. R. Taneur, Paris.

C.E. Faxon del.

Picart fr. sc.

RHUS METOPIUM, L.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

RHUS TYPHINA.

Staghorn Sumach.

BRANCHES and leaf-stalks densely velvety-hairy. Leaflets 11 to 31, pale on the lower surface. Fruit covered with long hairs.

Rhus typhina, Linnæus, *Amœn.* iv. 311. — Miller, *Dict.* ed. 8, No. 2. — Medicus, *Bot. Beob.* 1782, 228. — Wangenheim, *Nordam. Holz.* 95. — Marshall, *Arbust. Am.* 129. — Walter, *Fl. Car.* 255. — Ehrhart, *Beitr.* vi. 89. — Castiglioni, *Viag. negli Stati Uniti*, ii. 355. — Moench, *Meth.* 72. — Willdenow, *Spec.* i. 1478; *Enum.* 323. — Schoellenbach, *Abbild. Bäume*, ii. 77, t. 46. — Schkuhr, *Handb.* i. 239. — Michaux, *Fl. Bor.-Am.* i. 182. — *Nouveau Duhamel*, ii. 164, t. 47. — Persoon, *Syn.* i. 324. — Desfontaines, *Hist. Arb.* ii. 325. — Poiret, *Lam. Dict.* vii. 503. — Pursh, *Fl. Am. Sept.* i. 204. — Bigelow, *Fl. Boston.* 72. — Nuttall, *Gen.* i. 203. — Roemer & Schultes, *Syst.* vi. 643. — Hayne, *Dendr. Fl.* 33. — Elliott, *Sk.* i. 360. — Torrey, *Fl. N. Y.* i. 128. — De Candolle, *Prodr.* ii. 67. — Sprengel, *Syst.* i. 936. — Watson, *Dendr. Brit.* i. t. 17, 18. — Hooker, *Fl. Bor.-Am.* i. 126. — Don, *Gen. Syst.* ii. 70. — Spach, *Hist. Vég.* ii. 212. — Bennett, *Pl. Jav. Rar.* 80. — Torrey & Gray, *Fl. N. Am.* i. 217, 680. — Dietrich, *Syn.* ii. 1002. — Emerson, *Trees Mass.* ed. 2, ii. 571, t. — Darlington, *Fl. Cestr.* ed. 3, 43. — Chapman, *Fl.* 69. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 93. — Koch, *Dendr.* i. 576. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 63. — Engler, *De Candolle Monogr. Phaner.* iv. 377. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 52. — Watson & Coulter, *Gray's Man.* ed. 6, 119.

R. **typhina**, var. **arborescens**, Willdenow, *Enum.* 323. — De Candolle, *Prodr.* ii. 67.

R. **typhina**, var. **frutescens**, Willdenow, *Enum.* 323. — De Candolle, *Prodr.* ii. 67.

A tree, occasionally thirty-five or forty feet in height, with copious milky white viscid juice turning black on exposure, a slender and often slightly reclining trunk twelve or fourteen inches in diameter, and stout, upright, often contorted branches which form a low flat head; or more frequently a tall shrub, spreading by underground shoots into broad thickets. The bark of the trunk is dark brown and is smooth, or occasionally separates into small square scales. The branchlets are thick and are coated with long soft hairs which are pink when they appear in early spring, later turn bright green and then brown, and are short and dark-colored in the second season. The branchlets, which do not become glabrous until after their third or fourth year, in their second season are marked with large leaf-scars and with small orange-colored lenticels which enlarge vertically with the expansion of the bark and do not disappear for several years. The winter-buds are protected by a covering of thick pale brown tomentum; the terminal bud is obtuse, with almost triangular scales, and is nearly twice the size of the globular axillary buds. The leaves are sixteen to twenty-four inches long and have stout stalks usually red on the upper side; these are covered with soft pale hairs, and, enlarged at the base, surround and inclose the buds developed in their axils. The leaflets are borne on very short thick petiolules and are oblong, rather remotely and sharply serrate or rarely laciniate, long-pointed, and rounded or slightly heart-shaped at the base, with stout midribs and primary veins forking near the margin; they are opposite, or the lower ones slightly alternate, the three or four middle pairs being considerably longer than those at the two extremities of the leaf. The back of the leaflets as they unfold, like the young shoots and the petioles, is covered with bright red hairs. The leaflets are bright yellow-green until they are half-grown, and at maturity are dark green and rather opaque on the upper surface, and pale or often nearly white on the lower surface, which is then glabrous with the exception of the short fine hairs which cover the midrib and occasionally appear on its upper surface. In the autumn they turn bright scarlet with shades of crimson, purple, and orange. The male and female flowers are usually produced separately on different individuals,[1] and in dense panicles with

[1] Perfect flowers, if they occur at all on *Rhus typhina*, are very rare; and, so far as I have been able to observe, the staminate plants never produce fruit, although their small ovaries often have well-developed stigmas. The flowers of the pistillate plants do not

pubescent stems and branches and acuminate bracts half an inch to nearly an inch long, or occasionally twice that length on the female plant, and deciduous with the opening of the flowers. The panicle of sterile flowers is from eight to twelve inches in length and five or six inches in breadth, with wide-spreading branches, and is nearly a third larger than the more compact inflorescence of the fertile plant. The flowers are borne on slender pedicels produced from the axils of small acute pubescent bractlets. The calyx-lobes are acute and are covered on the outer surface with long slender hairs; in the male flower they are much shorter than the petals, and in the female flower almost as long. The petals of the staminate flower are yellow-green sometimes tinged with red, strap-shaped, rounded at the apex and reflexed above the middle at maturity, while those of the pistillate flower are green, narrower and acuminate with a thickened slightly hooded apex, and remain erect or nearly so. The disk is bright red and conspicuous, especially in the staminate flower. The stamens in the sterile flower are slightly exserted, with slender filaments and large bright orange-colored anthers; in the fertile flower they are much shorter, with minute rudimentary anthers. The ovary is ovoid and pubescent, and is crowned by three short spreading styles slightly connate at the base with large capitate stigmas; in the staminate flower it is glabrous, much smaller, and usually rudimentary. The sterile trees flower from the middle to the end of June and the fertile trees a week or ten days later, the flowers of both opening gradually and in succession. The fruit is borne in dense panicles six to eight inches long and two to three inches broad. It is depressed-globular, with a thin outer covering clothed with long acrid crimson hairs, and a small pale brown bony stone. The seed is slightly reniform, with an orange-brown smooth testa. The fruit, fully grown and colored in August, does not ripen until October; the panicles remaining on the branches and retaining their color until the new leaves appear the following spring.[1]

Rhus typhina grows in New Brunswick and extends westward through the valley of the St. Lawrence to southern Ontario and Minnesota, and southward through the northern states and along the Alleghany Mountains to northern Georgia and to central Alabama and Mississippi. It is a common plant in nearly every part of this region, although it is more generally distributed on the Atlantic seaboard than in the region west of the Alleghany Mountains. It usually grows on uplands in good soil, spreading into broad thickets to the exclusion of other plants, but is sometimes found on sterile gravelly banks and near the borders of streams and swamps.

The wood of *Rhus typhina* is light, brittle, soft, and coarse-grained, with a satiny surface that takes a good polish. Its layers of annual growth are clearly defined by four to six rows of large open ducts; it contains numerous obscure medullary rays and is orange-color streaked with green, with thick nearly white sapwood. It has been employed in inlaying furniture made of other woods, but probably is now little used. The specific gravity of the absolutely dry wood is 0.4357, a cubic foot weighing 27.15 pounds. From the young shoots of this tree pipes are made for drawing the sap of the Sugar Maple. The bark, especially of the root, as well as the leaves, is rich in tannin.[2] An infusion made from the astringent and refrigerant fruit is occasionally employed as a gargle.[3]

Rhus typhina was known to Europeans in the beginning of the seventeenth century. It was first described by Caspar Bauhin[4] in 1623, and was cultivated in England by John Parkinson[5] as early as

open until after the anthers of many of the early staminate flowers have shed their pollen, and fertilization is dependent on the pollen produced by the later flowers. Bees visit the flowers of all our species of Rhus and probably secure their fertilization.

[1] Individual plants almost intermediate in character between *Rhus typhina* and *Rhus glabra* are occasionally found, indicating the possibility of natural hybrids between the two species.

[2] See *Special Report No.* 26, *U. S. Dept. Agric.* 22, t. 3.

[3] Lawrence Johnson, *Man. Mat. Med. N. A.* 118.

The berries of *Rhus typhina*, or *Rhus glabra*, and of many other Sumachs have a sour, astringent, and rather agreeable flavor and can be eaten with impunity. Their acidity is confined to the hairs which cover the surface, and is due to malic acid and bimalate of calcium. (Kalm, *Travels*, English ed. i. 76. — *U. S. Dispens.* ed. 14, 772. — Guibourt, *Hist. Drog.* ed. 7, iii. 488.)

[4] *Rhus Virginianum*, *Pinax*, 521. — Ray, *Hist. Pl.* ii. 1591. — Plukenet, *Alm. Bot.* 318. — Miller, *Dict.* No. 1.

Rhus foliis pinnatis serratis, α, Linnæus, *Hort. Cliff.* 110.

Rhus foliis amplis pinnatis, racemis atro-rubentibus, Clayton, *Fl. Virgin.* 33.

[5] John Parkinson (1567–1650), a London apothecary, was herbalist to James I., a position due to his botanical writings and to the fame of his garden near London, in which many exotic plants were cultivated for the first time in England. His first publica-

1629.[1] The Staghorn Sumach is occasionally found in American gardens; and in central and northern Europe it is now one of the most common and popular exotic trees. It can be grown with a single stem for the decoration of the lawn, or it can be used with good effect to cover gravelly slopes, the margins of roads, and other waste places.

The excellent habit of the Staghorn Sumach, its ample and brilliantly colored foliage, its large panicles of male flowers, and its brilliant fruit make it one of the most beautiful of the small trees which inhabit the northern states.

The specific name, derived from τῦφος, relates to the supposed virtues of this plant in the treatment of fevers.

tion was the *Paradisi in Sole Paradisus Terrestris, or a garden of all sorts of pleasant flowers.* This was published in 1629, and is still interesting as it gives the best idea of the condition and contents of English gardens at the beginning of the seventeenth century. In 1640 appeared a much more comprehensive and important work from the pen of Parkinson, the *Theatrum Botanicum, the Theatre of Plants, or an Herbal of a large extent,* which was intended to include an account of all the plants described by earlier authors "encreased by the accesse of many hundreds of new, rare and strange Plants from all parts of the world." This book was Parkinson's life work, and was not published until ten years before his death. The Black Walnut, the Red Mulberry, and the Shellbark Hickory, as well as the Staghorn Sumach, are believed to have been first cultivated in England by Parkinson.

Parkinsonia, a genus of leguminous trees, natives of tropical America and southern Africa, with one of its species now widely distributed by cultivation through all the warmer parts of the world, commemorates Parkinson's services to botany and horticulture.

[1] *Sumach. Sive Rhus Virginiana. Virginian Sumacke. Theatr.* 1449, f. — Aiton, *Hort. Kew.* i. 365. — Loudon, *Arb. Brit.* ii. 550, f. 224.

EXPLANATION OF THE PLATES.

Plate CII. Rhus typhina.

1. A flowering branch of the staminate tree, natural size.
2. A flowering branch of the pistillate tree, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. Vertical section of a pistil, enlarged.
8. An ovule, much magnified.

Plate CIII. Rhus typhina.

1. A fruiting branch, natural size.
2. A fruit, enlarged.
3. Vertical section of a fruit, much enlarged.
4. A stone, enlarged.
5. An embryo, much magnified.
6. A winter branchlet, natural size.

C. E. Faxon del. Picart fr. sc.

RHUS TYPHINA. L.

A. Riocreux direx.t Imp. R. Taneur, Paris.

C.E. Fazon del. Picart fr. sc.

RHUS TYPHINA, L.

A. Riocreux direx.t Imp. R. Taneur, Paris.

RHUS COPALLINA.

Sumach.

BRANCHES and leaf-stalks pubescent. Petioles wing-margined; leaflets 9 to 21, green on the lower surface. Fruit pilose.

Rhus copallina, Linnæus, *Spec.* 266. — Miller, *Dict.* ed. 8, No. 6. — Medicus, *Bot. Beob.* 1782, 224. — Marshall, *Arbust. Am.* 128. — Wangenheim, *Nordam. Holz.* 96. — Walter, *Fl. Car.* 255. — Gærtner, *Fruct.* i. 205, t. 44. — Aiton, *Hort. Kew.* i. 366. — Plenck, *Icon.* t. 233. — Lamarck, *Ill.* ii. 346, t. 207, f. 3. — Jacquin, *Hort. Schoenb.* iii. 50, t. 341. — Willdenow, *Spec.* i. 1480; *Enum.* 324. — Michaux, *Fl. Bor.-Am.* i. 182. — Schkuhr, *Handb.* i. 237. — *Nouveau Duhamel*, ii. 160. — Persoon, *Syn.* i. 324. — Desfontaines, *Hist. Arb.* ii. 326. — Poiret, *Lam. Dict.* vii. 506. — Pursh, *Fl. Am. Sept.* i. 205. — Bigelow, *Fl. Boston.* 72. — Nuttall, *Gen.* i. 203. — Roemer & Schultes, *Syst.* vi. 647. — Hayne, *Dendr. Fl.* 34. — Elliott, *Sk.* i. 362. — Torrey, *Fl. N. Y.* i. 129. — De Candolle, *Prodr.* ii. 68. — Sprengel, *Syst.* i. 936. — Don, *Gen. Syst.* ii. 72. — Spach, *Hist. Vég.* ii. 214. — Torrey & Gray, *Fl. N. Am.* i. 217. — Dietrich, *Syn.* ii. 1003. — Loudon, *Arb. Brit.* ii. 554, f. 229. — Emerson, *Trees Mass.* 503. — Darlington, *Fl. Cestr.* ed. 3, 43. — Chapman, *Fl.* 69. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 92. — Koch, *Dendr.* i. 575. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 63. — Engler, *De Candolle Monogr. Phaner.* iv. 383. — Hemsley, *Bot. Biol. Am. Cent.* i. 217. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 55. — Watson & Coulter, *Gray's Man.* ed. 6, 119. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 67 (*Man. Pl. W. Texas*).

A tree, twenty-five to thirty feet in height, with colorless watery juice, a short stout trunk eight or ten inches in diameter, and erect spreading branches; or at the north a low shrub rarely more than four or five feet high. The bark of the trunk varies from a third to half an inch in thickness; the surface, which is light brown tinged with red and is marked by large elevated dark red-brown circular excrescences, separates into large thin papery scales. The branchlets when they appear are dark green tinged with red, and are more or less densely clothed with short fine or sometimes ferrugineous pubescence,[1] and are marked by many minute dark red lenticels; they appear slightly zigzag by the end of the first season on account of the swellings formed by the prominent leaf-scars, and are then covered with pale red-brown slightly puberulous bark dotted with conspicuous dark-colored lenticels. The winter-buds are minute, nearly globular, and clothed with dark rusty brown tomentum. The leaves are six to eight inches long and have slender pubescent petioles with enlarged bases nearly surrounding and inclosing the buds formed in their axils. The stalk of the leaf is more or less broadly wing-margined between the leaflets, the wings increasing in width towards the point of the leaf, each pair being broadest in the middle and narrowed at the two extremities. The leaflets are oblong or ovate-lanceolate, entire or remotely serrate above the middle, sharp-pointed or rarely emarginate at the apex, and acute or obtuse and often unequal at the base. The lower pairs are short-petiolulate and smaller than those above the middle of the leaf; the others are sessile with the exception of the terminal leaflet, which is sometimes contracted into a long-winged stalk. When they unfold, the leaflets are dark green and slightly puberulous on the upper surface, especially along the midrib, and are covered on the lower surface with fine silvery white pubescence; at maturity they are an inch and a half to two inches and a half long, and three quarters of an inch broad, with slighty thickened and revolute margins and prominent midribs and primary veins, and are then subcoriaceous, the upper surface being lustrous, dark green, and glabrous with the exception of the midrib, and the lower surface pale and pubescent. In the autumn the upper surface turns a dark rich maroon color. The male and female flowers are produced on

[1] The branchlets on some plants in the east are slightly puberulous, while west of the Mississippi River from Missouri to Texas it is not unusual to find both branchlets and leaf-stalks clothed with dense ferrugineous tomentum.

separate plants in short compact pubescent panicles, the lower branches being developed from the axils of the upper leaves. The panicles are four to six inches long and three or four inches broad, and are usually rather smaller on the female than on the male plant. The bracts and bractlets, which fall before the expansion of the flowers, are ovate or oblong and densely cinereo-pilose. The pedicels are stout and pubescent, and vary from an eighth to a quarter of an inch in length. The calyx is puberulous on the outer surface; its ovate acute segments are a third of the length of the ovate greenish yellow petals, which are rounded at the apex and at maturity are reflexed above the middle. The disk is red and conspicuous. The stamens are somewhat longer than the petals, with slender filaments and large orange-colored anthers; in the fertile flower they are much shorter than the petals and have minute rudimentary anthers. The ovary is ovate, pubescent, and contracted into three short thick spreading styles with large capitate stigmas; in the staminate flower it is glabrous and much smaller. In Texas the flowers appear in June, and in New England during the first days of August, those of the sterile plant opening in succession during nearly a month and continuing to unfold long after those of the fertile plant have fallen. The fruit ripens in five or six weeks, and is borne in stout compact often nodding clusters with pubescent stems and branches, which sometimes remain on the plants until the beginning of the following summer. The drupe is an eighth of an inch across, slightly obovate, and more or less flattened, with a thin bright red coat covered with short fine glandular hairs, a smooth bony orange-brown stone, and a reniform seed with a broad funicle and a smooth orange-colored testa.

Rhus copallina is widely and generally distributed from northern New England to Manatee and the shores of Caximbas Bay, Florida, and to Missouri, Arkansas, and the valley of the San Antonio River in Texas, and occurs in Cuba. It occupies dry hillsides and ridges, and becomes truly arborescent only in southern Arkansas and in eastern Texas; east of the Mississippi River it rarely grows more than a few feet high, and, spreading by underground stems, forms broad thickets on gravelly sterile land.

The wood of *Rhus copallina* is light, soft, and coarse-grained, with a satiny surface. It contains many thin obscure medullary rays and rows of large open ducts marking the layers of annual growth. It is light brown streaked with green and often tinged with red; the thin light-colored sapwood is composed of four or five layers of annual growth. The specific gravity of the absolutely dry wood is 0.5273, a cubic foot weighing 32.86 pounds.

The leaves, like those of the other species of the genus, are rich in tannin, and in some parts of the country, principally in Maryland, West Virginia, and Tennessee, they are gathered in large quantities and are ground for curing leather and for dyeing.[1] The acid and astringent fruit possesses the same properties and is used for the same purposes as the fruit of the other North American Sumachs.

Rhus copallina varies considerably in the size and form of its leaflets. The most distinct and probably the most constant of the varieties is var. *lanceolata*,[2] a small tree found from the prairies of eastern Texas to the valley of the Rio Grande. It is distinguished by its narrower acute often falcate and entire leaflets, and by its larger inflorescence and fruit. This plant grows to the height of twenty-five or thirty feet, with a trunk sometimes eight inches in diameter, covered with dark gray bark marked with red lenticular excrescences. It inhabits dry limestone uplands, often forming large thickets on river bluffs, about the heads of prairie ravines, and near the banks of small streams. The flowers appear in July or August, and the fruit, which is dull red or sometimes green, ripens in early autumn and falls before the beginning of winter. The specific gravity of the absolutely dry wood of this variety is 0.5184, a cubic foot weighing 32.31 pounds.

[1] *Special Report No.* 26, *U. S. Dept. Agric.* 26, t. 5.

[2] Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 158 (*Pl. Lindheim.* ii.). — Torrey, *Bot. Mex. Bound. Surv.* 44. — Watson, *Proc. Am. Acad.* xvii. 338. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 53. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 67 (*Man. Pl. W. Texas*).

A variety[1] of *Rhus copallina* with white flowers occurs on rocky cliffs near New Braunfels in Texas.[2]

Rhus copallina was one of the rare exotic trees cultivated by Bishop Compton[3] in his garden at Fulham near London, to which it had probably been sent from Virginia by Bannister;[4] and the first description of the species was drawn up from this cultivated plant and published by Ray in the *Historia Plantarum*[5] in 1688.

The foliage of *Rhus copallina* is more beautiful in summer and in autumn than that of the other North American Sumachs; and although it does not usually grow to the size of the Staghorn Sumach, or bear such conspicuous flowers and fruit, it is a beautiful and attractive plant, and especially useful when slopes of sterile gravel or rocky hillsides are to be clothed with shrubs.

The specific name was given to it by Linnæus under the mistaken idea that this plant furnished the copal gum of commerce.

[1] *Rhus copallina*, var. *leucantha*, De Candolle, *Prodr.* ii. 68. — Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 158 (*Pl. Lindheim.* ii.). — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 53. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 67 (*Man. Pl. W. Texas*).

R. leucantha, Jacquin, *Hort. Schoenb.* iii. 50, t. 342. — Spach, *Hist. Vég.* ii. 215.

[2] Engler (*De Candolle Monogr. Phaner.* iv. 384) distinguishes the following forms: —

Var. *latifolia*, with oblong or oblong-elliptical leaflets two and a half to three times as long as broad, the wings broad or narrow.

Var. *angustialata*, with a wing scarcely one twenty-fourth of an inch broad (Cuba, Wright, No. 2290). (*R. copallina*, var. Grisebach, *Cat. Pl. Cub.* 67.)

Var. *latialata*, with a wing from one twelfth to one sixth of an inch broad.

Var. *angustifolia*, with lanceolate leaflets five to six times longer than broad.

Var. *integrifolia*.

Var. *serrata*.

[3] See i. 6.

[4] See i. 6.

[5] *Rhus Virginianum Lentisci foliis*, ii. 1799.

Rhoi Obsoniorum similis Americana, Gummi candidum fundens, non serrata, foliorum rachi medio alata, Plukenet, *Phyt.* t. 56, f. 1; *Alm. Bot.* 318.

Rhus foliis pinnatis, pedunculo communi membranaceo articulato, Royen, *Fl. Leyd. Prodr.* 244. — Linnæus, *Mat. Med.* 50.

Rhus elatior foliis cum impari pinnatis, petiolis membranaceis articulatis, foliolis minoribus nonnunquam non exacte oppositis: racemis atrorubentibus, Clayton, *Fl. Virgin.* 149.

EXPLANATION OF THE PLATES.

Plate CIV. Rhus copallina.

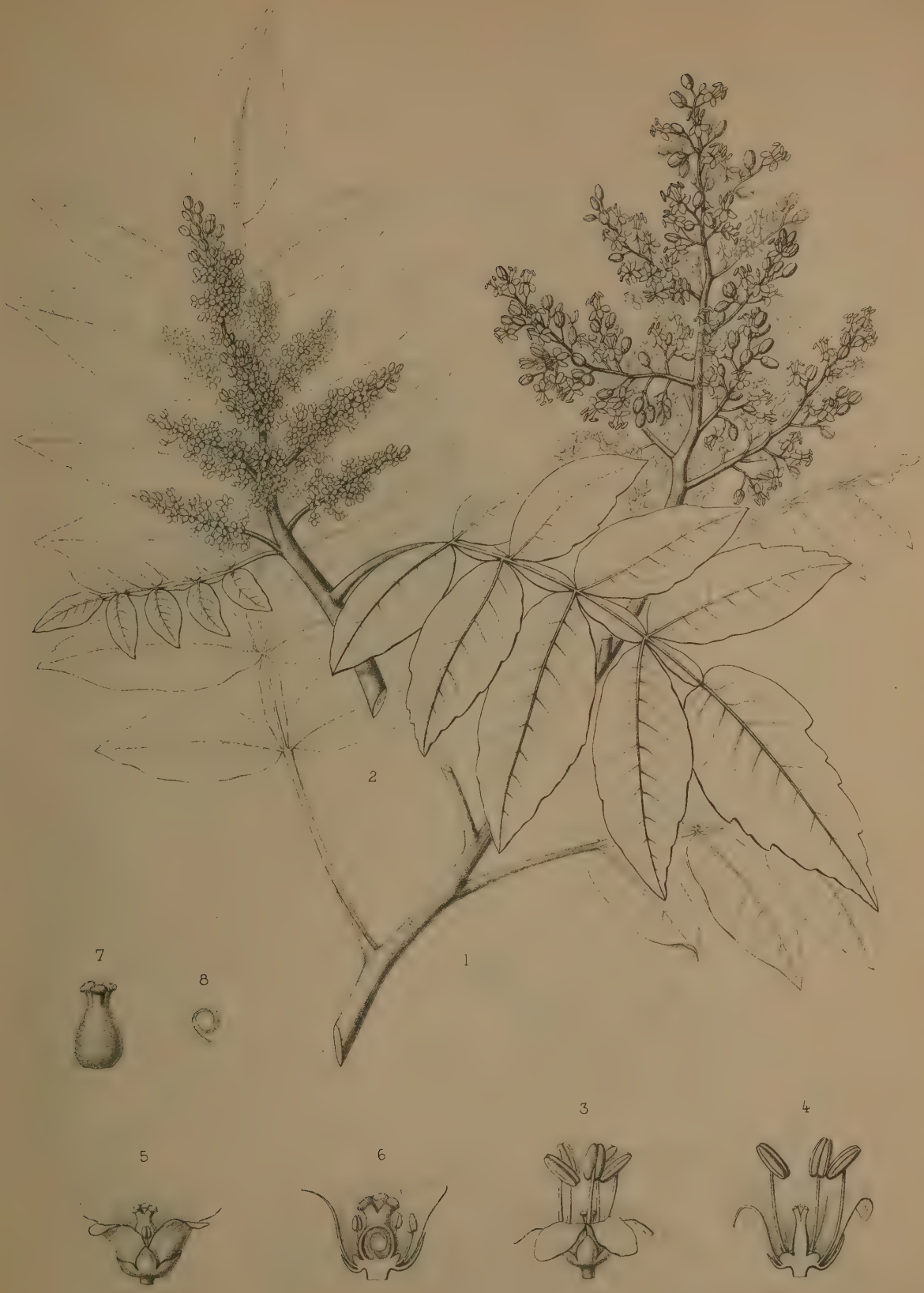
1. A flowering branch of the staminate tree, natural size.
2. A flowering branch of the pistillate tree, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. A pistil, enlarged.
8. An ovule, much magnified.

Plate CV. Rhus copallina.

1. A fruiting branch, natural size.
2. A fruit, enlarged.
3. Vertical section of a fruit, enlarged.
4. A stone, enlarged.
5. A seed, enlarged.
6. An embryo, much magnified.
7. A winter branchlet, natural size.

Plate CVI. Rhus copallina, *var.* lanceolata.

1. A branch of a staminate panicle, natural size.
2. A branch of a pistillate panicle, natural size.
3. A staminate flower, enlarged.
4. A pistillate flower, enlarged.
5. A fruiting branch, natural size.
6. Vertical section of a fruit, enlarged.



C. E. Faxon del. Picart fr. sc.

RHUS COPALLINA, L.

A. Riocreux direx.t Imp. R. Taneur, Paris.

C. E. Faxon del. Picart fr. sc.

RHUS COPALLINA, L.

A. Riocreux direct.r Imp. R. Taneur, Paris.

C. E. Faxon del. Picart fr. sc.

RHUS COPALLINA, Var. LANCEOLATA, Gray.

A. Riocreux direx.t Imp. R. Taneur, Paris

RHUS VERNIX.

Poison Dogwood. Poison Sumach.

FLOWERS diœcious, in axillary panicles. Fruit globular, white; the stone striate. Leaves 7 to 13-foliolate.

Rhus Vernix, Linnæus, *Spec.* 265. — Medicus, *Bot. Beob.* 1782, 223. — Marshall, *Arbust. Am.* 130. — Wangenheim, *Nordam. Holz.* 92. — Castiglioni, *Viag. negli Stati Uniti*, ii. 356, t. 14. — Plenck, *Icon.* t. 234. — Lamarck, *Ill.* ii. 346, t. 207, f. 2. — Willdenow, *Spec.* i. 1479; *Enum.* 323. — Schkuhr, *Handb.* i. 236. — Michaux, *Fl. Bor.-Am.* i. 183. — *Nouveau Duhamel*, ii. 165. — Persoon, *Syn.* i. 324. — Desfontaines, *Hist. Arb.* ii. 325. — Poiret, *Lam. Dict.* vii. 505. — Bigelow, *Fl. Boston.* 72. — Nuttall, *Gen.* i. 203. — Pursh, *Fl. Am. Sept.* i. 205. — Roemer & Schultes, *Syst.* vi. 646. — Hayne, *Dendr. Fl.* 34. — Elliott, *Sk.* i. 362. — Sprengel, *Syst.* i. 936.

Toxicodendron pinnatum, Miller, *Dict.* ed. 8, No. 4.

R. venenata, De Candolle, *Prodr.* ii. 68. — Hooker, *Fl. Bor.-Am.* i. 126. — Don, *Gen. Syst.* ii. 71. — Spach, *Hist. Vég.* ii. 215. — Torrey & Gray, *Fl. N. Am.* i. 218, 681. — Dietrich, *Syn.* ii. 1003. — Torrey, *Fl. N. Y.* i. 130. — Emerson, *Trees Mass.* ed. 2, ii. 575, t. — Darlington, *Fl. Cestr.* ed. 3, 44. — Chapman, *Fl.* 69. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 93. — Bailey, *Am. Nat.* vii. 5, f. 3. — Engler, *De Candolle Monogr. Phaner.* iv. 397. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 54. — Watson & Coulter, *Gray's Man.* ed. 6, 119.

A small tree, with acrid poisonous juice turning black on exposure, occasionally twenty or twenty-five feet in height, with a trunk five or six inches in diameter, and slender rather pendulous branches forming a narrow round head; or more often a shrub sending up from the ground a cluster of slender stems. The bark of the trunk is thin, smooth, or sometimes slightly striate and pale light gray in color. The branchlets are glabrous when they appear, reddish brown and covered with minute orange-colored lenticular spots; they are orange-brown at the end of the first season, and a year later are light gray and still marked by lenticels and by large elevated conspicuous leaf-scars. The winter-buds are acute and covered with dark purple scales puberulous on the back and margins with short pale hairs; the terminal bud varies from an eighth of an inch to nearly an inch in length and is two or three times larger than the axillary buds. The leaves are from seven to fourteen inches in length, and are borne on slender petioles which are usually light red or red streaked with green on the upper side. The leaflets are obovate-oblong with entire revolute margins, and are slightly unequal at the base and contracted at the acute or rounded apex; they are short-petiolulate with the exception of the terminal one, which is sometimes raised on a stalk an inch in length. The leaflets when they unfold are bright orange-colored and coated, especially on the margins and under surface, with fine pubescence; they soon become glabrous, and at maturity are three or four inches long and an inch and a half or two inches broad, dark green and lustrous on the upper surface and pale on the lower, with prominent midribs scarlet above, primary veins forking near the margin, and conspicuous reticulated veinlets. In October they turn to brilliant scarlet or orange and scarlet colors. The staminate and pistillate flowers are produced on different plants in long narrow axillary pubescent panicles aggregated near the ends of the branches. The bracts and bractlets are acute, pubescent, and early deciduous. The pedicels are slender, pubescent, and bibracteate near the middle. The calyx-lobes are acute and a third of the length of the yellow-green acute petals, which are erect and slightly reflexed towards the apex. The stamens are nearly twice as long as the petals, with slender filaments and large orange-colored anthers; in the fertile flower they are not more than half the length of the petals, with small rudimentary anthers. The ovary is ovoid-globose and surmounted by three short thick spreading styles terminating in large capitate stigmas. The flowers appear late in June or early in July. The fruit ripens in September and often hangs on the branches until the following spring; it is produced in long graceful racemes

and is often flattened and slightly gibbous, and is tipped with the dark remnants of the styles. The outer coat is thin, more or less striated at maturity, ivory white or white tinged with yellow, and very lustrous; the stone is conspicuously grooved, thin, rather membranaceous than coriaceous, and, like the testa of the seed, pale yellow.

Rhus Vernix is common in all the region between northern New England and northern Georgia and Alabama, and extends westward to northern Minnesota and to Arkansas and western Louisiana, inhabiting wet swamps often inundated during a portion of the year.

The wood of *Rhus Vernix* is light, soft, and coarse-grained, with three or four rows of large open ducts clearly defining the layers of annual growth, and thin, very obscure medullary rays. It is light yellow streaked with brown, the sapwood being lighter colored, and when absolutely dry has a specific gravity of 0.4382, a cubic foot weighing 27.31 pounds.

Rhus Vernix is one of the most dangerous plants of the North American flora. The juices and the effluvium from the flowers possess the properties found in those of *Rhus Metopium* and *Rhus Toxicodendron*, and to most persons are even more injurious.[1] The extreme brilliancy and beauty in autumn of the foliage of the Poison Dogwood,[2] as this plant is almost invariably called in the northern states, allure many people ignorant of its true character to gather and handle it, and cases of serious poisoning are a common consequence. It contains the volatile principle toxicodendric acid found in the allied *Rhus Toxicodendron*, and possesses properties of as great medicinal value as that plant.[3] An infusion of the young branches and leaves is employed in homœopathic practice;[4] and the juice can be used as a black lustrous durable varnish very similar to that furnished by the Japanese Lacquer-tree.[5]

Rhus Vernix was first described by Plukenet in the *Phytographia*[6] published in 1691, and was cultivated in the Physic Garden at Chelsea[7] in England as early as 1713.[8]

[1] Kalm, *Travels*, English ed. i. 77. — Cutler, *Mem. Am. Acad.* i. 428. — B. S. Barton, *Coll.* i. 24. — Bigelow, *Med. Bot.* i. 96, t. 10. — *U. S. Dispens.* ed. 14, 908. — *Nat. Dispens.* ed. 2, 1464. — James C. White, *Dermatitis Venenata*, 31.

[2] *Rhus Vernix* is also known in some parts of the country as Poison Elder and as Poison-tree.

[3] Lawrence Johnson, *Man. Med. Bot. N. A.* 118.

[4] Millspaugh, *Am. Med. Pl. in Homœopathic Remedies*, i. 37, t. 37.

[5] Bigelow, *l. c.*

[6] *Arbor Americanus alatis foliis, succo lacteo venenata, Phyt.* t. 145, f. 1; *Alm. Bot.* 45.

Rhus Americanum rachi (cui adnectuntur folia) rubra, folio lato utrinque glabro non serrato, pistachiæ simili, Boerhaave, *Hort. Lugd. Bat.* ii. 229. — Colden, *Cat. Pl. Novebor.* 64.

Arbor cujus lignum venenatum, Paul Dudley, *Phil. Trans.* xxxi. 145. — Sherard, *Phil. Trans.* xxxi. 147.

Toxicodendron Carolinianum, foliis pinnatis, floribus minimis herbaceis, Miller, *Dict.* No. 3.

Toxicodendron foliis alatis, fructu rhomboideo, Dillenius, *Hort. Elth.* 390, t. 292, f. 377.

Rhus foliis pinnatis integerrimis, Linnæus, *Hort. Cliff.* 110; *Hort. Ups.* 68; *Mat. Med.* 50. — Royen, *Fl. Leyd. Prodr.* 244. — Clayton, *Fl. Virgin.* 148.

[7] Aiton, *Hort. Kew.* i. 366. — Loudon, *Arb. Brit.* ii. 552, f. 226.

[8] The confusion which has long existed with reference to the name of this plant was due to the fact that Linnæus, misled by the similarity of the Japanese Varnish-tree, united this with the American Poison Sumach, calling the species thus enlarged *Rhus Vernix*, the name, of course, relating to the properties of the Japanese and not of the American plant. De Candolle found that the two plants were distinct and made new names for them both, dropping entirely the Linnæan specific name *Vernix*. This, however, is the oldest name, and clearly belongs to the American and not to the Japanese plant, as Linnæus's description in the *Hortus Cliffortianus*, as well as that in the *Species Plantarum*, makes it clear that he considered the American plant as the type of his species to which he referred the Japanese plant of Kaempfer. (See in this connection discussions upon the differences in the two trees by Abbé Mazeas, Philip Miller, and John Ellis. *Phil. Trans.* xlix. 157, 161, 866.)

EXPLANATION OF THE PLATES.

Plate CVII. Rhus Vernix.

1. A branch of the staminate tree, natural size.
2. A branch of the pistillate tree, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. An ovule, much magnified.

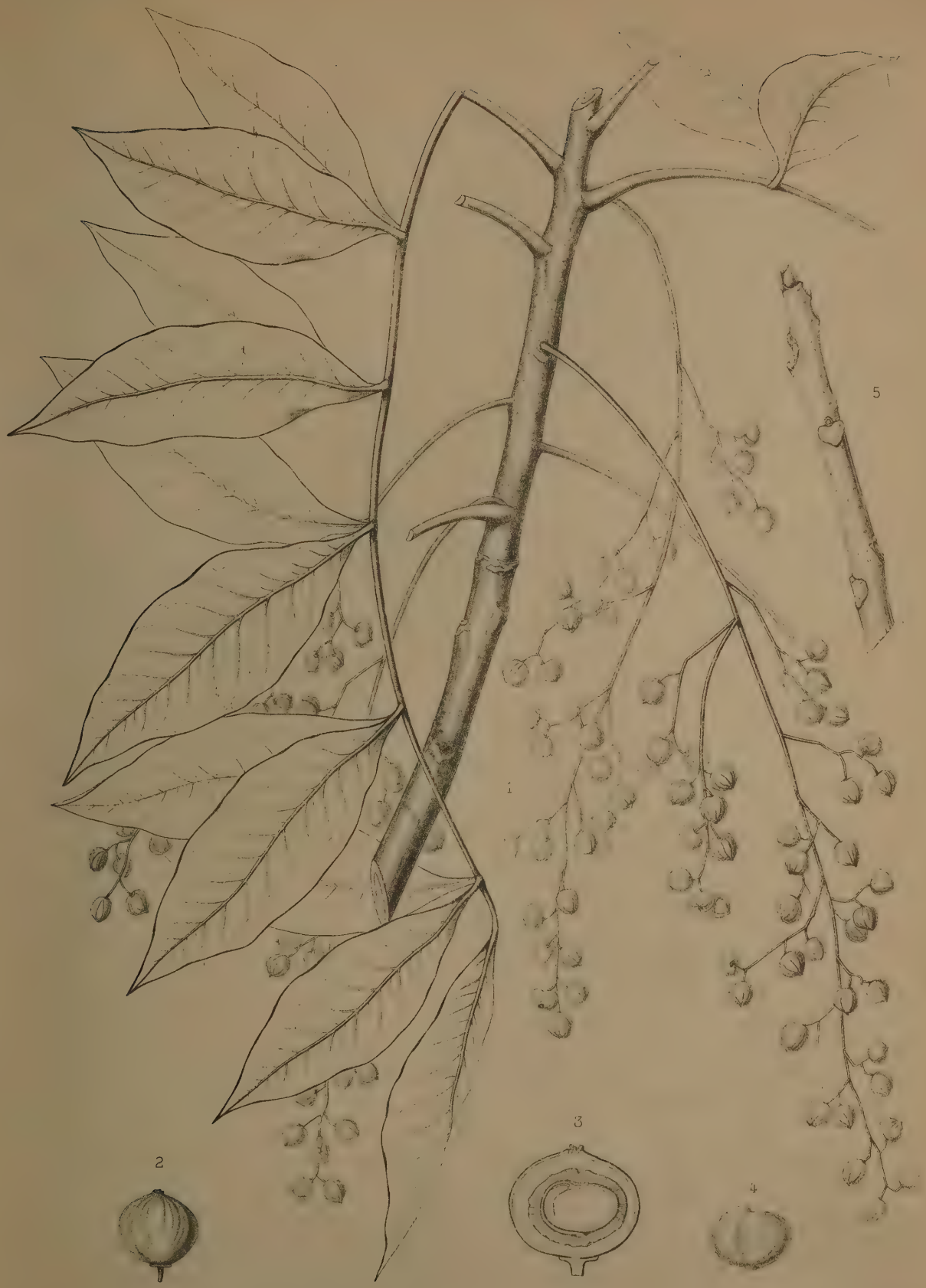
Plate CVIII. Rhus Vernix.

1. A fruiting branch, natural size.
2. A fruit, enlarged.
3. Vertical section of a fruit, enlarged.
4. A stone, enlarged.
5. A winter branchlet, natural size.

C E. Faxon del. Picart fr. sc.

RHUS VERNIX, L.

A. Riocreux dirext Imp. R. Taneur, Paris.



C E Faxon del. Picart fr. sc.

RHUS VERNIX, L

A. Riocreux direx.t Imp. R. Taneur, Paris.

RHUS INTEGRIFOLIA.

Mahogany.

FLOWERS dicœcious or polygamo-dicœcious, on conspicuously bracteate pedicels; sepals orbicular, colored. Fruit pubescent. Leaves usually simple, persistent.

Rhus integrifolia, Bentham & Hooker, *Gen.* i. 419. — Brewer & Watson, *Bot. Cal.* i. 110. — Greene, *Bull. Cal. Acad.* ii. 393; *Pittonia*, i. 87, 201. — Engler, *De Candolle Monogr. Phaner.* iv. 387. — T. S. Brandegee, *Proc. Cal. Acad.* ser. 2, i. 208; ii. 139. — Sargent, *Garden and Forest*, ii. 375.

Styphonia integrifolia, Nuttall; Torrey & Gray, *Fl. N. Am.* i. 220; *Sylva*, iii. 4, t. 82. — Dietrich, *Syn.* ii. 1226. — Bentham, *Bot. Voy. Sulphur*, 11. — Walpers, *Rep.* i. 555; v. 414. — Torrey, *Bot. Mex. Bound. Surv.* 44. — Gray, *Ives' Rep.* 9.

Styphonia serrata, Nuttall; Torrey & Gray, *Fl. N. Am.* i. 220; *Sylva*, iii. 6. — Dietrich, *Syn.* ii. 1226. — Walpers, *Rep.* v. 414.

Rhus integrifolia, var. **serrata**, Engler, *De Candolle Monogr. Phaner.* iv. 388.

A low evergreen tree, rarely thirty feet in height, with a short stout trunk two to three feet in diameter, and numerous long spreading branches; or usually a small often almost prostrate shrub. The surface of the bark, which varies from a quarter of an inch to half an inch in thickness, is bright reddish brown and exfoliates in large plate-like scales. The branchlets are bright reddish brown and are marked with many small elevated lenticels, and when they appear are covered with thick pale pubescence which gradually disappears in their second and third years. The winter-buds are small, obtuse, and clothed with a thick coat of pale tomentum. The leaves are simple or rarely ternate,[1] with thickened revolute or spinosely toothed margins, and are pointed or rounded at the apex; they are puberulous when young, and at maturity are an inch and a half to three inches long, an inch to an inch and a half broad, thick and coriaceous, dark yellow-green on the upper surface, paler below, and glabrous with the exception of the stout petioles, broad thick midribs, and prominent reticulated veins. The flowers, which appear from February to April, are a quarter of an inch across when expanded, and are borne in short dense racemes forming hoary-pubescent terminal panicles an inch to three inches in length, the males and females on different plants. The pedicels are short and stout and are furnished with from two to four broadly ovate pointed persistent scarious ciliate and pubescent bracts. The sepals are rose-color, orbicular and concave, with scarious ciliate margins, and are rather less than half the length of the rounded ciliate reflexed rose-colored petals. The disk is annular, broad, and fleshy. The stamens are as long as the petals, with slender filaments and pale anthers, and in the fertile flower are minute and rudimentary. The ovary is broadly ovate, pubescent, and surmounted by three short thick connate styles with large capitate stigmas. The fruit is half an inch in length, ovate, flattened, more or less gibbous, with thick dark red densely pubescent and resinous viscid juice and a kidney-shaped smooth light chestnut-brown stone which has thick walls, and a flat seed with a thin pale coat and a broad dark-colored funicle covering its side.

Rhus integrifolia is found in the immediate neighborhood of the Pacific coast from Santa Barbara to the shores of Magdalena Bay in Lower California and on the Santa Barbara and Cedros Islands. It usually occurs in sandy sterile soil along the sea-beaches and bluffs, in California rising generally to the height of one or two feet only and forming close impenetrable thickets which offer the least possible resistance to the ocean gales.[2] In more sheltered situations and on some of the islands[3] it assumes a

[1] W. S. Lyon, *Bot. Gazette*, xi. 205, 333. — T. S. Brandegee, *Zoë*, i. 111, t. 4, f. 3–7 (*Plants of Santa Catalina Island*).

[2] C. R. Orcutt, *The Western American Scientist*, vii. 149.

[3] Professor Edward L. Greene noticed on San Miquel, one of the smaller of the Santa Barbara group, that the sands drifting from the beaches had almost entirely exterminated this species

tree-like habit, probably attaining its greatest size on the shores of Todos Santos Bay in Lower California.

The wood of *Rhus integrifolia* is hard and heavy, with bands of open ducts distinctly marking the layers of annual growth, and many thin conspicuous medullary rays. It is of a handsome bright clear red color, with thin pale sapwood composed of eight or ten layers of annual growth. The specific gravity of the absolutely dry wood is 0.7830, a cubic foot weighing 48.80 pounds.[1] It possesses a high fuel value, and is cut and consumed in large quantities in the regions where it abounds.

The berries, from which a white oily acid substance exudes, are occasionally used in southern California in the preparation of a cooling beverage,[2] either fresh or after having been roasted and ground.

Rhus integrifolia was discovered by Thomas Nuttall[3] in 1835 in the neighborhood of San Diego.

once abundant on the island, as shown by the remnants of dead trees which have furnished fuel to the parties of seal hunters and fishermen who for years have frequented the island. One of these skeleton trees had produced gnarled branches thirty feet in length, spreading out horizontally and not more than a foot above the surface of the ground (*Pittonia*, i. 78).

[1] *Garden and Forest*, iii. 332.

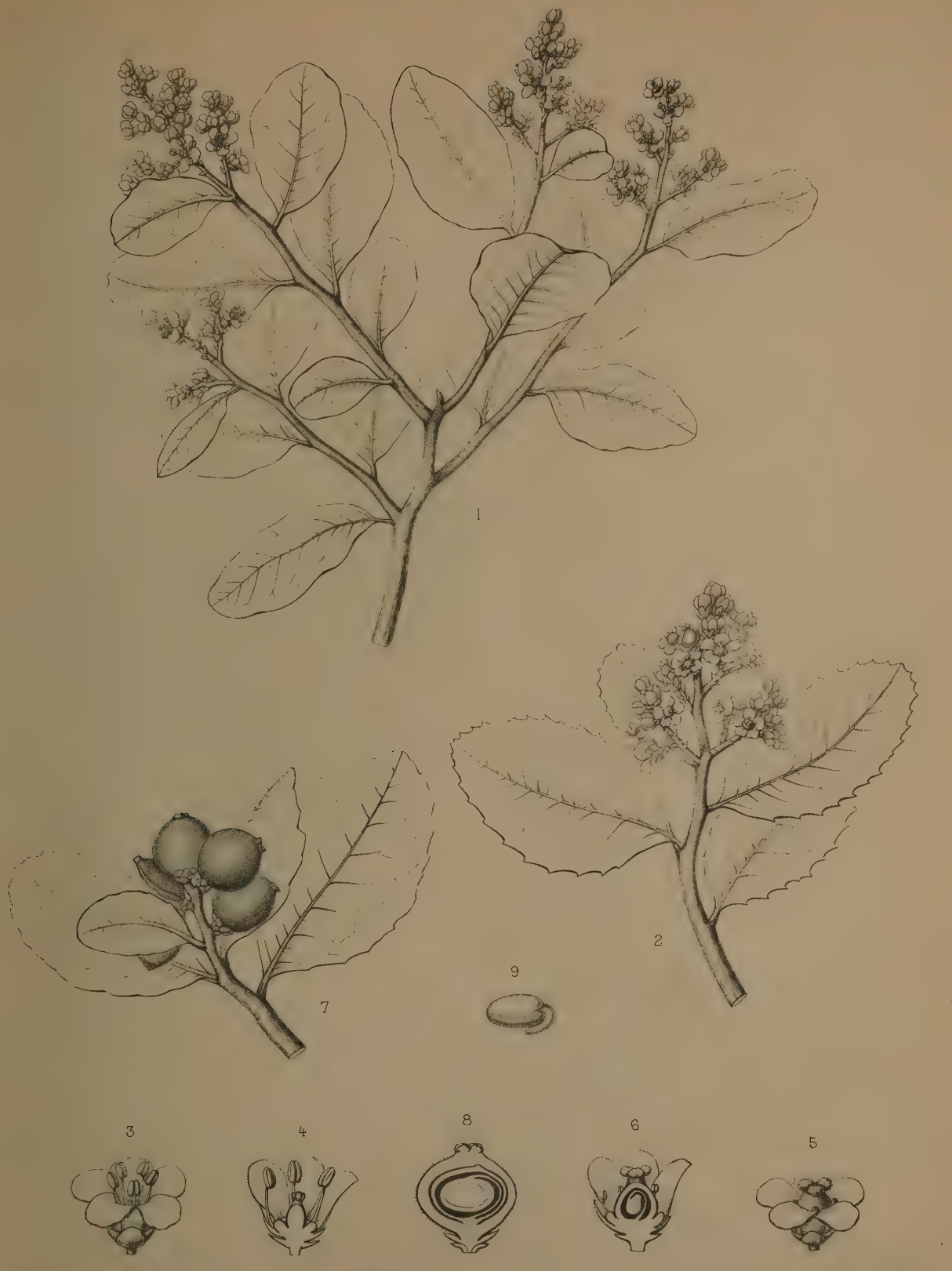
[2] C. R. Orcutt, *The Western American Scientist*, iii. 46.

[3] See ii. 34.

EXPLANATION OF THE PLATE.

Plate CIX. Rhus integrifolia.

1. A flowering branch of the staminate tree, natural size.
2. A flowering branch of the pistillate tree, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. A fruiting branch, natural size.
8. Vertical section of a fruit, enlarged.
9. An embryo, much magnified.



C.E. Faxon del. Picart fr. sc.

RHUS INTEGRIFOLIA, Benth et Hook.

A. Riocreux direx.t Imp. R. Taneur, Paris.

EYSENHARDTIA.

Flowers in dense spicate racemes; calyx 5-toothed; petals erect, free; ovary subsessile, 2 to 3 or rarely 4-ovuled. Legume small, compressed; seeds oblong-reniform, solitary or rarely 2. Leaves unequally pinnate.

Eysenhardtia, Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 489. — Meisner, *Gen.* 89. — Endlicher, *Gen.* 1270. — Bentham & Hooker, *Gen.* i. 492. — Baillon, *Hist. Pl.* ii. 287.

Viborquia, Ortega, *Dec.* v. 66 (not Thunberg nor Moench).

Varennea, De Candolle, *Mém. Légum.* 494.

Small glandular-punctate trees or shrubs, with slender terete branches. Leaves alternate, unequally pinnate; stipules subulate, caducous; leaflets oblong, mucronate or emarginate at the apex, short-petiolulate, numerous, stipelate. Flowers short-pedicellate, in long spicate racemes, terminal or produced from the axils of the upper leaves. Bracts subulate, caducous. Calyx tubular-campanulate, conspicuously glandular-punctate, five-toothed, the acute teeth nearly equal, persistent. Disk cupuliform, adnate to the base of the calyx-tube. Corolla subpapilionaceous; petals erect, free, nearly equal, oblong-spatulate, rounded at the apex, unguiculate, creamy white; the standard concave, slightly broader than the wings and keel. Stamens ten, inserted with the petals, diadelphous, the superior one free, shorter than the others, the remainder united above the middle into a tube; anthers uniform, oblong, attached on the back at the middle, two-celled, the cells opening longitudinally. Ovary subsessile, contracted into a long slender uncinate style, geniculate and conspicuously glandular below the apex; stigma introrse, oblique; ovules two or three, rarely four, attached to the interior angle of the ovary, superposed, descending, amphitropous. Legume small, oblong or linear-falcate, compressed, tipped with the remnants of the style, indehiscent, pendent or erect. Seed usually solitary, rarely two, oblong-reniform, destitute of albumen; testa coriaceous. Embryo filling the cavity of the seed; cotyledons flat, fleshy; radicle superior, short and erect.

Eysenhardtia belongs to the warmer parts of the New World, where it is found in the region from western Texas and Arizona to southern Mexico, Lower California, and Guatemala. Four species are distinguished. The type of the genus, *Eysenhardtia polystachya*,[1] a slender shrub, is widely distributed through western Texas south of the Colorado River and is common in the Mexican Sierra Madre. *Eysenhardtia spinosa*,[2] a low intricately branched shrub, occurs on the mountain ranges of Chihuahua and in Lower California, and *Eysenhardtia orthocarpa*, sometimes a small tree, on those of western Texas, New Mexico, Arizona, and northern Mexico. *Eysenhardtia adenostylis*,[3] the most southern species of the genus yet discovered, is known only in Guatemala.

[1] ***Eysenhardtia polystachya.***

Viborquia polystachya, Ortega, *Dec.* v. 66, t. 9.

E. amorphoides, Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 491, t. 592. — De Candolle, *Prodr.* ii. 257. — Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 173 (*Pl. Lindheim.* ii.). — Hemsley, *Bot. Biol. Am. Cent.* i. 236. — Watson, *Proc. Am. Acad.* xvii. 339. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 76 (*Man. Pl. W. Texas*).

Varennea polystachya, De Candolle, *l. c.* 522.

[2] Engelmann, *Jour. Bost. Soc. Nat. Hist.* vi. 174 (*Pl. Lindheim.* ii.). — Hemsley, *l. c.* — Brandegee, *Proc. Cal. Acad.* ser. 2, ii. 148 (*Pl. Baja Cal.*).

[3] Baillon, *Adansonia*, ix. 239.

The wood of some species is hard and close-grained and affords valuable fuel. The genus is not known to possess other useful properties.

The generic name commemorates the botanical labors of Karl Wilhelm Eysenhardt,[1] professor of botany in the University of Königsberg.

[1] Karl Wilhelm Eysenhardt (1794–1825), a native of Berlin, gave promise in a number of scientific papers of a brilliant career closed by death almost at its beginning.

EYSENHARDTIA ORTHOCARPA.

LEAVES composed of 10 to 23 pairs of leaflets. Legume nearly straight, pendent.

Eysenhardtia orthocarpa, Watson, *Proc. Am. Acad.* xvii. 339. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 55. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 76 (*Man. Pl. W. Texas*).

E. amorphoides, var. orthocarpa, Gray, *Smithsonian Contrib.* v. 37 (*Pl. Wright.* ii.).

E. amorphoides, Torrey, *Bot. Mex. Bound. Surv.* 51 (in part).

A small tree, occasionally eighteen or twenty feet in height, with a trunk six or eight inches in diameter, separating, three or four feet above the ground, into a number of slender branches; or more often a low rigid shrub. The bark of the trunk is a sixteenth of an inch thick, light gray, and broken into large plate-like scales, their surface exfoliating in thin layers. The branchlets are at first coated with ashy gray pubescence; this disappears during the second year, when they are reddish brown and roughened with numerous glandular excrescences. The leaves are four or five inches long, with pubescent midribs grooved on the upper side, ten to twenty-three pairs of leaflets, and small scarious deciduous stipules. The leaflets are oval, rounded or sometimes slightly emarginate at the apex, with stout petiolules and minute scarious deciduous stipels, and are furnished on the lower side with conspicuous chestnut-brown glands; they are pale gray-green, glabrous or slightly puberulous on the upper surface, pubescent below, especially along the prominent midrib, reticulate-veined, and conspicuously glandular-punctate, with thickened slightly revolute margins, and vary from half to two thirds of an inch in length and from an eighth to a quarter of an inch in breadth. The flowers are produced in May in axillary pubescent spikes three or four inches long; they are borne on slender pubescent pedicels and are rather less than half an inch long. The calyx is many-ribbed, pubescent, covered with large and conspicuous glands, and half the length of the white petals, which vary little in size and shape and are ciliate on their margins. The legume is half an inch long, pendent, nearly straight or slightly falcate, conspicuously thickened on the two edges, and usually contains a single seed near the apex.

Eysenhardtia orthocarpa is found from the valley of the upper Guadaloupe River in western Texas to the Santa Catalina and Santa Rita mountains of southern Arizona, and extends southward into Mexico to the neighborhood of San Luis Potosí and to southwestern Chihuahua. It grows in gravelly soil on arid slopes and dry ridges, and is only known to assume an arborescent form near the summit of the Santa Catalina Mountains.

The wood of *Eysenhardtia orthocarpa* is heavy, hard, and close-grained, with numerous rows of open ducts clearly marking the layers of annual growth, and many thin medullary rays. It is light reddish brown in color, with thin clear yellow sapwood composed of seven or eight layers of annual growth. The specific gravity of the absolutely dry wood is 0.8740, a cubic foot weighing 54.47 pounds.

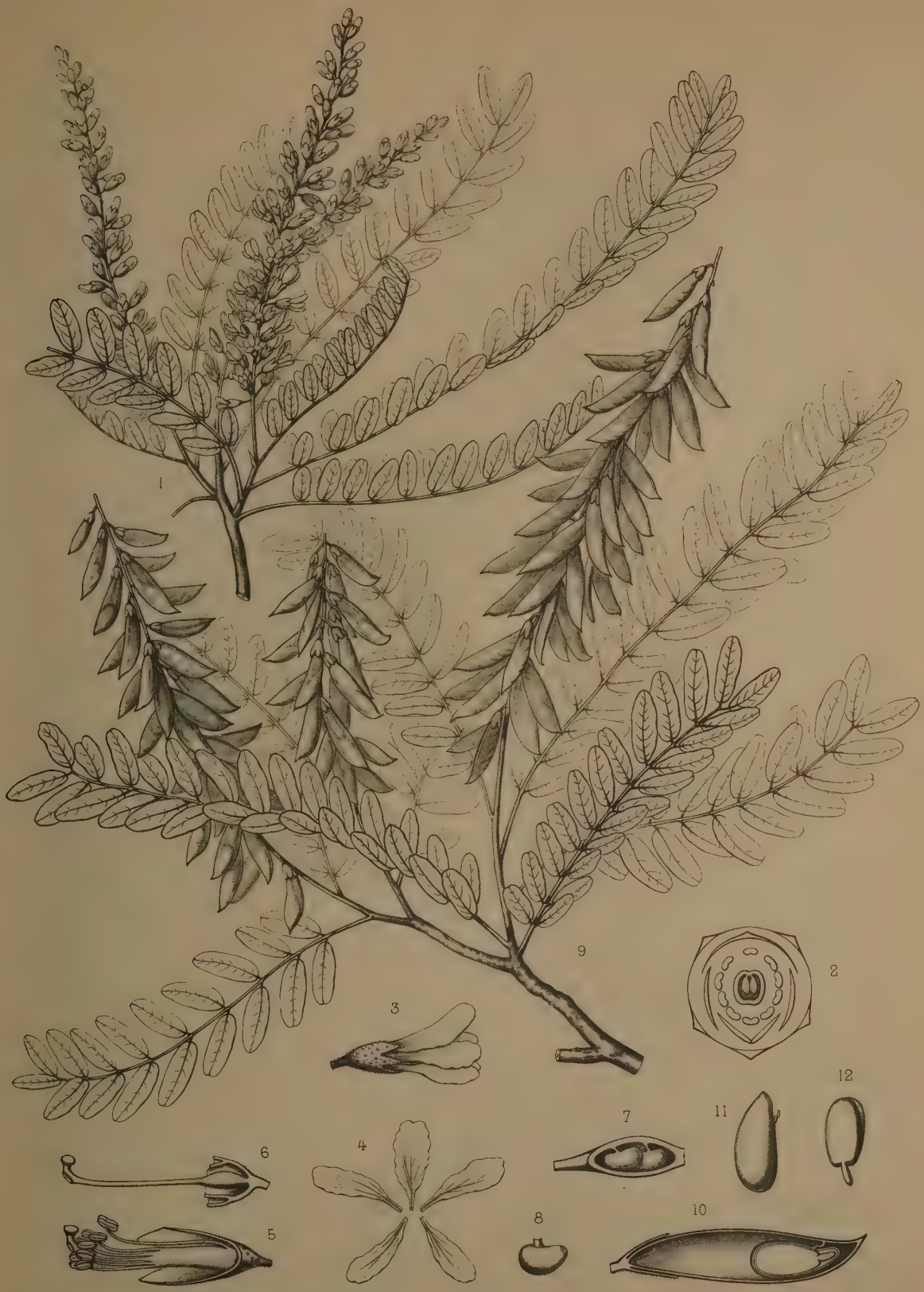
Eysenhardtia orthocarpa was discovered by Charles Wright[1] in August, 1849, on the banks of a stream between the Pecos and Limpia rivers in western Texas.

[1] See i. 94.

EXPLANATION OF THE PLATE.

Plate CX. Eysenhardtia orthocarpa.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. The petals of a flower displayed, enlarged.
5. A flower, the corolla and a portion of the calyx removed, enlarged.
6. A pistil, enlarged.
7. Vertical section of an ovary, enlarged.
8. An ovule, much magnified.
9. A fruiting branch, natural size.
10. Vertical section of a legume, enlarged.
11. A seed, enlarged.
12. An embryo, much magnified.



C.E. Faxon del. Picart fr. sc.

EYSENHARDTIA ORTHOCARPA, Watson.

A. Riocreux direx.t Imp. R. Taneur, Paris.

DALEA.

FLOWERS in pedunculate spikes or racemes; calyx 5-toothed; standard cordate with a free claw; claws of the wings and keel-petals adnate to the staminal tube; ovary 2 or rarely 3, sometimes 4 to 6-ovuled. Legume ovate, compressed, generally indehiscent. Seed subreniform, usually solitary. Leaves most often unequally pinnate.

Dalea, Linnæus, *Gen.* 349. — Meisner, *Gen.* 89. — Endlicher, *Gen.* 1270. — Bentham & Hooker, *Gen.* i. 493. — Baillon, *Hist. Pl.* ii. 285.
Parosella, Cavanilles, *Elench. Hort. Matrit.*
Cylipogon, Rafinesque, *Jour. Phys.* lxxxix. 97.
Trichopodium, Presl, *Bot. Bemerk.* 52.
Asagræa, Baillon, *Adansonia,* ix. 232; *Hist. Pl.* ii. 288 (not Lindley).

Glandular-punctate herbs, small shrubs, or rarely trees. Leaves alternate, unequally pinnate, rarely digitately three-foliate or simple; stipules generally minute, subulate, deciduous; leaflets small, entire, often stipellate. Flowers purple, blue, white, or rarely yellow, usually sessile, in loose pedunculate spikes or racemes, terminal or opposite the leaves. Bracts membranaceous or setaceous, broad, concave above, glandular-punctate. Calyx five-toothed or lobed, the divisions nearly equal, often accrescent after anthesis, then sometimes plumose, persistent. Corolla papilionaceous; petals unguiculate; standard cordate, free, inserted in the bottom of a tubular disk connate to the calyx-tube, rather shorter than the wings and keel with claws adnate to and jointed upon the staminal tube. Stamens ten or sometimes nine through the suppression of the superior one, monadelphous, united into a tube cleft above and cup-shaped towards the base; anthers uniform, attached on the back near the base, often surmounted with a gland, two-celled, the cells opening longitudinally. Ovary sessile or short-stalked, contracted into a slender subulate style with a minute terminal stigma rarely slightly dilated; ovules usually two, sometimes three, seldom four to six, attached to the interior angle of the ovary, superposed, amphitropous, the micropyle superior. Legume ovate, sometimes conspicuously ribbed, more or less inclosed in the calyx, membranaceous, most often indehiscent, one-seeded. Seed oblong or reniform, destitute of albumen; testa coriaceous. Embryo filling the cavity of the seed; cotyledons broad and flat; the radicle superior, accumbently inflexed.

The genus Dalea is confined to the New World. Nearly a hundred species have been described.[1] More than half are Mexican and tropical and Central American;[2] one species occurs in Chile,[3] ten in the Andes of Peru,[4] and two in the Galapagos Islands;[5] the remainder belong to the central, western, and southwestern regions of the United States.[6] Many of the species are herbs, and others are low undershrubs; but in the arid region of the extreme southwestern territory of the United States individuals of a peculiar group[7] of these plants grow to a considerable size, and among them is one which occasionally assumes the habit and attains the size of a small tree.[8]

[1] De Candolle, *Prodr.* ii. 244. — Walpers, *Rep.* i. 652; ii. 855; v. 513; *Ann.* i. 228; ii. 359; iv. 482.

[2] Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 480. — Martens & Galeotti, *Bull. Acad. Brux.* x. pt. ii. 41. — Schlechtendal, *Linnæa,* xii. 290. — Hemsley, *Bot. Biol. Am. Cent.* i. 236.

[3] C. Gay, *Fl. Chil.* ii. 87 (Psoralea).

[4] Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 484. — De Candolle, *Prodr.* ii. 247. — Jameson, *Syn. Pl. Æquator.* i. 147.

[5] Hooker f. *Trans. Linn. Soc.* xx. 225, 226. — Andersson, *Stockh. Acad. Handl.* 1853, 109 (*Om Galapagos-Öarnes Veg.*).

[6] Torrey & Gray, *Fl. N. Am.* i. 307. — Brewer & Watson, *Bot. Cal.* i. 141. — Coulter, *Man. Rocky Mt. Bot.* 57; *Contrib. U. S. Nat. Herb.* i. 77 (*Man. Pl. W. Texas*). — Watson & Coulter, *Gray's Man.* ed. 6, 132.

[7] Xylodalea, Brewer & Watson, *l. c.*

[8] *Dalea arborescens* (Torrey, *Mem. Am. Acad.* n. ser. v. 316 [Gray, *Pl. Thurber.*]. — Brewer & Watson, *l. c.*) was discovered by Frémont at the eastern base of the San Fernando Mountains in southern California during his second transcontinental journey, and was described by him as "a small tree." All attempts, however,

None of the species is known to possess properties useful to man, although several are cultivated for the beauty of their flowers.[1]

The genus was dedicated by Linnæus[2] to Dr. Samuel Dale,[3] an English botanist and writer on the materia medica.

to find an arborescent Dalea in this region have proved unsuccessful, although this species has recently been noticed on the Mohave Desert growing as a low shrub.

[1] Ventenat, *Jard. Cels*, 40, t. 40. — Hooker, *Exot. Fl.* t. 43; *Bot. Mag.* t. 2486. — Nicholson, *Dict. Gard.*

[2] *Hort. Cliff.* 363, t. 22.

[3] Samuel Dale (1659–1739), an English apothecary and physician of Boking, is best known by his *Pharmacologia seu Manuductio ad Materiam Medicam*, published in 1693. Several editions of this work appeared, and a supplement in 1705. It was considered in its time one of the most rational books that had been written on the subject. Dale also wrote a History of Harwich (1730), and between 1692 and 1736 made numerous communications to the Royal Society, of which he was a member, including in a letter to Sir Hans Sloane, *Descriptions of the Moose Deer and a sort of Stag in Virginia, with remarks on the Flying Squirrel of America.* He practiced his profession at Braintree in Essex for many years, and was the neighbor and friend of Ray, whose executor he became. His herbarium, bequeathed to the Apothecaries' Company, is now preserved in the British Museum.

DALEA SPINOSA.

FLOWERS loosely racemose; calyx 10-ribbed, conspicuously glandular; petals adnate to the staminal tube by their bases only. Legume exserted from the calyx for half its length; ovules 4 to 6.

Dalea spinosa, Gray, *Mem. Am. Acad.* n. ser. v. 315 (*Pl. Thurber.*); *Ives' Rep.* 10. — Torrey, *Pacific R. R. Rep.* iv. 78; vii. pt. iii. 9, t. 3; *Bot. Mex. Bound. Surv.* 53. — Walpers, *Ann.* iv. 485. — Watson, *Proc. Am. Acad.* xi. 132. — Brewer & Watson, *Bot. Cal.* i. 143. — Hemsley, *Bot. Biol. Am. Cent.* i. 247. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 55. — Brandegee, *Proc. Cal. Acad.* ser. 2, ii. 148 (*Pl. Baja Cal.*).

Asagræa spinosa, Baillon, *Adansonia*, ix. 232; *Hist. Pl.* ii. 288.

A small spinose tree, occasionally eighteen or twenty feet high, with a short stout contorted trunk sometimes twenty inches in diameter and divided near the ground into several upright branches; or more often a low rigid intricately branched shrub. The bark of the trunk is dark gray-brown, nearly a quarter of an inch thick, deeply furrowed, and roughened on the surface with small persistent scales. The branchlets are reduced to slender sharp spines coated with fine hoary pubescence, bearing minute nearly triangular scarious caducous bracts, and marked by occasional glandular fistules. These ultimate branchlets are developed from stouter ones also covered when young with hoary pubescence, but glabrous in their third year, with pale brown bark roughened with lenticels which as it exfoliates shows a pale green inner bark. The leaves are few and irregularly scattered near the base of the spinose branchlets; they are cuneate or linear-oblong, sessile or nearly so, and marked by a few large glands, especially on the margins, which are entire, wavy, or, on vigorous young shoots or seedling plants, remotely and coarsely serrate; they are hoary-pubescent, three quarters of an inch to an inch in length, and an eighth of an inch to half an inch in width, with a broad midrib and three pairs of lateral ribs, and are very deciduous, remaining only for a few weeks on the branches. The stipules are minute, ovate, and acute, and resemble the leaves and branchlets in their pubescent covering. The flowers are produced in June in racemes an inch or an inch and a half long, with slender spinescent hoary-pubescent rachises; they are nearly half an inch long and are borne on short pedicels developed from the axils of minute bracts. The calyx-tube is ten-ribbed and marked with about five glands between the dorsal ribs; the lobes are short, ovate, rounded or more or less ciliate on the margins, and reflexed at maturity. The petals are dark violet-blue; the standard is cordate, reflexed, and furnished at the base of the blade with two conspicuous glands; the wings and keel are attached to the staminal tube by their bases only and are almost equal in size, rounded at the apex, and more or less irregular at the base by a deep lobe. The ovary, which is pubescent and glandular-punctate, develops into a one-seeded pubescent ovate compressed pod twice as long as the calyx and tipped with the remnants of the recurved style. The seed is reniform and an eighth of an inch long, with a lustrous pale brown coat irregularly marked with darker spots.

Dalea spinosa inhabits the Colorado Desert of California, where it occurs at Agua Caliente, Toras, and in a few other localities, and extends eastward to the valley of the lower Gila River in Arizona and the adjacent parts of Sonora, and to Calamujuet in Lower California.[1]

The wood of *Dalea spinosa* is light, soft, and rather coarse-grained, with many evenly distributed open ducts and numerous thin medullary rays. It is walnut-brown in color, with nearly white sapwood composed of twelve to fifteen layers of annual growth. The specific gravity of the absolutely dry wood is 0.5536, a cubic foot weighing 34.50 pounds.

[1] Where it was collected by T. S. Brandegee.

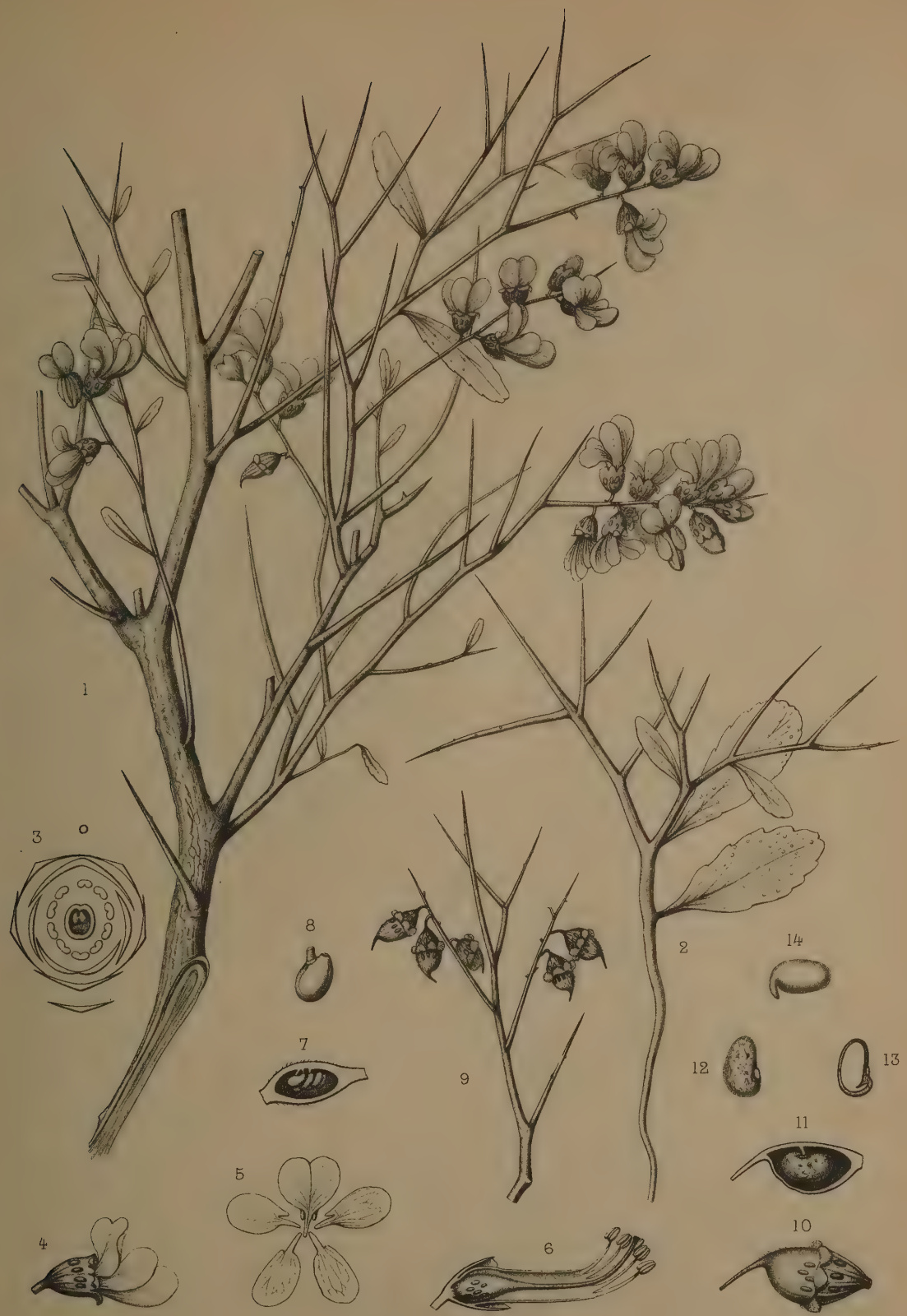
Dalea spinosa was first gathered by Frémont in 1849, but his specimen showed neither flowers nor fruit, and the species was first described from the specimens collected in 1852 on the Colorado Desert by Dr. George Thurber,[1] the botanist of the United States and Mexican Boundary Survey Commission.

[1] George Thurber (1821–1890) was born in Providence, Rhode Island, where he was educated and for several years practiced his profession of apothecary. Through the influence of Dr. John Torrey he was appointed in 1850 botanist to the United States Commission to establish the boundary line between our territory and that of Mexico; and to his scientific duties in connection with the survey were added those of quartermaster and commissary. Dr. Thurber devoted five years to exploring the natural resources of the boundary region from the shores of the Gulf of Mexico to those of the Pacific Ocean, discovering many interesting plants, including a few trees. The most important of these discoveries were described by Professor Asa Gray in the Memoirs of the American Academy (*Plantæ Thurberianæ*). Thurber, on the completion of his duties in connection with the survey, settled in New York, where he was employed in the United States Assay Office, and later became a lecturer before the Cooper Union and in the New York College of Pharmacy. In 1859 he was appointed professor of botany and horticulture in the Agricultural College of Michigan, retaining his chair until 1863, when he became editor of the *American Agriculturist*, a position which he held until within a short time of his death. He was a most accomplished and successful writer on all matters pertaining to horticulture and related subjects, and exerted a wide and always wholesome influence through his own writings and through the improvement which his editorial example produced in the character and scope of the agricultural and horticultural journals of the United States. A Malvaceous plant of the Mexican boundary, named by Gray *Thurberia* in honor of the discoverer, is now referred to *Gossypium*, but *Thurberia*, a genus of American grasses, plants to which he devoted years of study, and which he knew better than any of his contemporaries, keeps green the memory of a learned and interesting man.

EXPLANATION OF THE PLATE.

Plate CXI. Dalea spinosa.

1. A flowering branch, natural size.
2. Portion of a seedling plant showing serrate leaves, natural size.
3. Diagram of a flower.
4. A flower, enlarged.
5. The petals of a flower, displayed, enlarged.
6. Vertical section of a flower, the corolla removed, enlarged.
7. Vertical section of an ovary, enlarged.
8. An ovule, much magnified.
9. A fruiting branch, natural size.
10. A fruit, enlarged.
11. Vertical section of a fruit, enlarged.
12. A seed, enlarged.
13. Vertical section of a seed, enlarged.
14. An embryo, much magnified.



C.E. Faxon, del. Picart fr. sc.

DALEA SPINOSA, Gray.

A. Riocreux direx.t Imp. R. Taneur, Paris.

ROBINIA.

Flowers in drooping axillary racemes; calyx 5-lobed, the upper lobes subconnate; standard large, reflexed, barely longer than the wings and keel; ovary stipitate, many-ovuled. Legume linear, compressed, 2-valved. Leaves unequally pinnate.

Robinia, Linnæus, *Gen.* 220. — Adanson, *Fam. Pl.* ii. 323. — A. L. de Jussieu, *Gen.* 358. — De Candolle, *Mém. Légum.* 273. — Endlicher, *Gen.* 1274. — Meisner, *Gen.* 89. — Bentham & Hooker, *Gen.* i. 499. — Baillon, *Hist. Pl.* ii. 267.

Trees or rarely shrubs, spreading by underground shoots, with slender terete or slightly many-angled zigzag branchlets of indefinite growth. Buds minute, naked, subpetiolar, three or four together, superposed, protected collectively in a depression by a scale-like covering lined on the inner surface with a thick coat of tomentum and opening in early spring, its divisions persistent through the season on the base of the branchlet developed usually from the upper bud.[1] Leaves unequally pinnate, deciduous; leaflets oval, entire, petiolulate, reticulate, penniveined, stipellate; stipules setaceous, becoming spinescent at maturity, persistent. Flowers long-pedicellate in short pendulous racemes developed from the axils of the leaves of the year. Bracts and bractlets small, acuminate, early deciduous. Calyx campanulate, five-toothed, or cut, the upper lobes shorter than the others, cohering for a part of their length and valvate in æstivation. Corolla papilionaceous; petals shortly unguiculate, inserted on a tubular disk glandular on the inner surface and connate with the base of the calyx-tube; standard ample, naked on the inner surface, obcordate, reflexed; wings oblong-falcate, free; keel-petals valvate in æstivation, incurved, obtuse, united below. Stamens ten, inserted with the petals, diadelphous; the nine inferior united into a tube often enlarged at the base and cleft on the upper side, the superior one free at the base and connate in the middle with the staminal tube, or finally free; anthers similar, or those opposite the petals sometimes rather smaller, ovate, attached on the back near the base, two-celled, the cells opening longitudinally. Ovary linear-oblong, stipitate; style subulate, inflexed, bearded along the inner side near the apex; stigma terminal, small; ovules suspended from the interior angle of the ovary, two-ranked, superposed, amphitropous, the micropyle superior. Legume many-seeded, linear-compressed, almost sessile, two-valved, the seed-bearing suture narrow-winged; valves thin and membranaceous. Seed oblong-oblique, transverse, estrophiolate, attached by a stout persistent incurved funiculus enlarged at the point of attachment to the placenta; testa thin, crustaceous; albumen thin, membranaceous. Embryo large; cotyledons oval, fleshy; radicle short, much reflexed, accumbent.

The genus Robinia is North American. Four species inhabit the territory of the United States; and two, or possibly more, very imperfectly known, occur in Mexico.[2] Robinia was once more widely distributed over the earth's surface, and the traces of its presence in the Old World are found in the Cretaceous and Eocene rocks of central Europe, where analogues of existing forms abound.[3] Of the species of our territory three are arborescent and one is shrubby.[4]

[1] The subpetiolar buds are often accompanied by a supplementary supra-axillary bud which sometimes develops late in the season into a feeble branchlet which apparently does not survive the first winter.

[2] Schlechtendal, *Linnæa*, xii. 305, 306. — Hemsley, *Bot. Biol. Am. Cent.* i. 259.

[3] Saporta, *Origine Paléontologique des Arbres*, 312.

[4] *Robinia hispida*, Linnæus, *Mant.* 101. — Schmidt, *Oestr. Baum.* i. 30. t. 31. — *Bot. Mag.* t. 311. — De Candolle, *Prodr.* ii. 262. — Guimpel, Otto & Hayne, *Abbild. Holz.* 83, t. 66. — Torrey & Gray, *Fl. N. Am.* i. 295. — Watson & Coulter, *Gray's Man.*, ed. 6, 134.

One of the species produces hard, durable, and very valuable timber, and its bark, especially that of the roots, possesses tonic and emetic properties. All the species of the United States are valued as ornamental plants and are largely cultivated for the beauty of their flowers. Many insects feed upon Robinia,[1] which is also affected, although not very seriously, by fungal diseases.[2]

The generic name made by Linnæus, who discarded that of Tournefort, Pseudacacia,[3] commemorates the botanical labors of Jean Robin,[4] herbalist of the king of France, and of his son, Vespasien Robin.[5]

[1] The most serious enemy of the Robinia is a borer (*Cyllene robiniæ*, Forster) which riddles the trunk and in many parts of the country has destroyed the value of *Robinia Pseudacacia* as a timber tree. The different species are injured by another borer (*Cossus robiniæ*, Harris) which, however, generally does more damage to the Oak. The boring larva of a moth (*Sciapteron robiniæ*, H. Edwards) is said to destroy *Robinia Pseudacacia* in some parts of Nevada and California (*Bull. Brooklyn Entomolog. Soc.* iii. 72).

The foliage of Robinia is attacked by several insects, one of the most common and generally distributed being a butterfly (*Eudamus tityrus*, Fab.). The larvæ of a small moth (*Depressaria robiniella*, Packard) draw the leaves together and devour them (*Bull. No.* 7, *U. S. Entomolog. Com.* 98), and they are eaten by several species of leaf-miners, one of the most destructive of which is a small beetle (*Odontota dorsalis*, Thunb.). The larvæ of a small saw-fly (*Nematus similaris*, Norton) feed on the leaves; and the genus is not exempt from the attacks of the Clisiocampas and other insects which are found on many of our forest trees. Small caterpillars are occasionally found in the pods, and the seed is often devoured by weevils.

[2] Robinia, in common with other arborescent *Leguminosæ* of North America, is affected by only a few diseases which can be traced directly to the action of fungi, and these are not especially dangerous. They are caused by species like *Aglaospora profusa*, De Not., *Valsa ceratophora*, Tul., and others found on many woody plants; while a few like *Valsaria Robiniæ*, Cooke, *Sphæronema Robiniæ*, B. & C., and *Sporocybe Robiniæ*, Fr., are considered peculiar to the genus. These are all small black fungi whose characters are not to be recognized without the aid of the microscope.

[3] *Inst.* 649, t. 417.

[4] Jean Robin (1550–1629), a Parisian apothecary whom Tournefort called the most distinguished botanist of his time, established a garden near the Louvre which soon became famous. About 1586 he was made arborist and herbalist of Henry III. and was appointed director of the gardens of the Louvre, a position which he continued to fill under Henry IV. and Louis XIII. In 1597 he laid out and planted the garden of the Faculty of Medicine of Paris, into which he introduced a number of valuable plants, including *Hibiscus Syriacus* and the Tuberose, which before his time was only known in France in the gardens of Provence and Languedoc, but which he made popular at the north. His published works include descriptions of new plants from Spain and Guinea published in his *Jardin de Louis XIII.* and catalogues of the plants which he cultivated. In 1601 these numbered 1371 species, and in 1624 had increased to 1800 as described in his *Enchiridion Isagogicum* published in that year.

[5] Vespasien Robin (1579–1660) was early associated with his father, whom he succeeded as king's arborist. The younger Robin made a number of journeys in the south of France and among the Alps and Pyrenees and into Spain and the Barbary States for the purpose of collecting plants for the Jardin du Roi, in which, in 1635, he was made assistant professor of botany, becoming professor at the death of Gui de Labrosse. In 1653 he was replaced in this position by Dionys Joncquet, although until his death he retained the honorary title of lecturer upon medical plants. He was associated with his father in the publication of the *Enchiridion*.

CONSPECTUS OF THE SPECIES OF THE UNITED STATES.

Flowers in slender loose racemes; legume smooth; branches naked	1. R. PSEUDACACIA.
Flowers in short crowded glandular-hispid racemes; legume glandular-hispid; branches naked	2. R. NEO-MEXICANA.
Flowers in crowded oblong racemes; legume glandular-hispid; branches and petioles clammy	3. R. VISCOSA.
Flowers in short crowded racemes; legume glandular-hispid; branches and petioles bristly-pubescent (shrubby)	4. R. HISPIDA.

ROBINIA PSEUDACACIA.

Locust. Acacia. Yellow Locust.

FLOWERS white, in slender loose racemes. Legume smooth. Branches naked.

Robinia Pseudacacia, Linnæus, *Spec.* 722. — Miller, *Dict.* ed. 8, No. 1. — Du Roi, *Harbk. Baum.* ii. 320. — Marshall, *Arbust. Am.* 133. — Wangenheim, *Nordam. Holz.* 16, t. 7. — Castiglioni, *Viag. negli Stati Uniti*, ii. 367. — L'Heritier, *Stirp. Nov.* 158. — Schmidt, *Oestr. Baum.* i. 31, t. 32. — Walter, *Fl. Car.* 186. — Gærtner, *Fruct.* ii. 307, t. 145. — Willdenow, *Spec.* iii. 1131; *Enum.* 769; *Berl. Baumz.* 372. — Schoellenbach, *Abbild. Bäume*, ii. 67, t. 42. — Michaux, *Fl. Bor.-Am.* ii. 65. — *Nouveau Duhamel*, ii. 60, t. 16. — Poiret, *Lam. Dict.* vi. 222; *Ill.* iii. 163, t. 606. — Persoon, *Syn.* ii. 311. — Desfontaines, *Hist. Arb.* ii. 302. — Michaux f. *Hist. Arb. Am.* iii. 245, t. 1. — Pursh, *Fl. Am. Sept.* ii. 487. — Nuttall, *Gen.* ii. 118. — Hayne, *Dendr. Fl.* 140. — Elliott, *Sk.* ii. 242. — Jaume St. Hilaire, *Traité des Arbres*, t. 71. — De Candolle, *Prodr.* ii. 261. — Sprengel, *Syst.* iii. 247. — Torrey, *Fl. N. Y.* i. 165. — Hooker, *Fl. Bor.-Am.* i. 140. — Audubon, *Birds*, t. 104. — Don, *Gen. Syst.* ii. 237. — Spach, *Hist. Vég.* i. 258. — Torrey & Gray, *Fl. N. Am.* i. 294. — Bigelow, *Fl. Boston.* ed. 3, 295. — Dietrich, *Syn.* iv. 1053. — Darlington, *Fl. Cestr.* ed. 3, 63. — Chapman, *Fl.* 94. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 48. — Baillon, *Hist. Pl.* ii. 209, f. 159. — Koch, *Dendr.* i. 55. — Emerson, *Trees Mass.* ed. 2, ii. 523, t. — Willkomm, *Forst. Fl.* ed. 2, 930. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 65. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 55. — Watson & Coulter, *Gray's Man.* ed. 6, 134.

Pseudacacia odorata, Moench, *Meth.* 145.

R. fragilis, Salisbury, *Prodr.* 336.

A tree, seventy to eighty feet in height, with a trunk three or four feet in diameter, and slender brittle usually erect branches which form a narrow oblong head. The bark of the trunk on fully grown individuals varies from an inch to an inch and a half in thickness; it is deeply furrowed and dark brown tinged with red, the surface being broken into small square persistent scales. The branchlets, which are terete or sometimes slightly many-angled, especially on vigorously growing plants, are marked with small pale scattered lenticels, and when they appear are coated with short appressed silvery white pubescence. This soon wears off, and during their first season they are pale green and puberulous, turning light reddish brown towards autumn, when they are glabrous or nearly so. The leaves when they unfold are covered with silvery pubescence, which, however, soon disappears; they are composed of seven to nineteen leaflets, and vary from eight to fourteen inches in length, with slender puberulous petioles which are grooved on the upper side and swollen at the base. The stipules are half an inch long, linear, subulate, membranaceous at first, coated with pubescence, and tipped with a small tuft of caducous brown hairs; ultimately they develop into hard woody straight or slightly recurved spines, which do not disappear for many years and increase in size with the growth of the branches until they are sometimes more than an inch long.[1] The leaflets are ovate, rounded or slightly truncate and minutely apiculate at the apex, very thin, dull dark blue-green on the upper, and pale on the lower surface, and glabrous at maturity with the exception of the slight puberulence which covers the under side of the slender midribs; they are an inch and a half to two inches long, and half an inch to three quarters of an inch broad, and are borne on stout petiolules an eighth of an inch to a quarter of an inch in length. The stipels are minute, linear, membranaceous, and early deciduous. The leaves turn pale clear yellow late in the autumn, just before falling. The flowers, which open late in May or early in June, are produced in loose puberulous racemes four or five inches long; they are nearly an inch in

[1] The stipules of *Robinia Pseudacacia* appear to be more developed on the lower than on the upper branches, and this fact leads Sir John Lubbock to suppose that they serve to protect the young growing branches presumably from herbivorous animals, while in the other species this protection is afforded by bristly hairs or by the gummy substance which exudes from the small globose glands that cover the branches of *R. viscosa*, a species also provided, however, with spiny stipules. (*Jour. Linn. Soc.* xxviii. 228.)

length and are filled with nectar and very fragrant. The pedicels, developed from the axils of minute caducous bractlets, are slender, half an inch long, and dark red or red tinged with green. The calyx is conspicuously gibbous on the upper side, pilose within and without, ciliate on the margin, and dark green blotched with red, especially on the upper side; the lower lobe is acuminate and much longer than the triangular lateral lobes; the upper divisions are short and nearly triangular. The petals are pure white with the exception of the large pale yellow blotch which marks the inner surface of the standard. The fruit, which attains nearly its full size by the end of July, ripens late in the autumn and hangs on the branches until the end of winter or the beginning of spring. It is borne in stout thick-stemmed racemes, and is three or four inches long and half an inch broad, with bright red-brown valves, and is usually four to eight-seeded. The seeds are three sixteenths of an inch long, and dark orange-brown with irregular darker markings.

Robinia Pseudacacia naturally inhabits the slopes of the Apalachian Mountains from Locust Ridge in Marion County, Pennsylvania, to northern Georgia; it has become widely naturalized in most of the territory of the United States east of the Rocky Mountains, and is perhaps indigenous on Crowley's Ridge in northeastern Arkansas and in some parts of western Arkansas and of eastern Indian Territory.[1] In its native forests the Locust is nowhere common and does not occupy the ground exclusively, but mingles singly or in groups of two or three with the Hickory, the Black Walnut, the Ash, the White Oak, the Cucumber Magnolia, and other trees which thrive in the deep rich soil in which the Locust grows to its largest size and produces its most valuable timber. It is most common and attains its best development on the western slopes of the mountains of West Virginia. In less favorable situations and at lower elevations, especially on gravelly soil, it spreads by underground stems into broad thickets of small and often stunted trees, and is now common in many parts of the northern and eastern states.

Robinia Pseudacacia is one of the most valuable timber-trees of the American forest. The wood is heavy, exceedingly hard and strong, close-grained, and very durable in contact with the ground. It is brown or more rarely light green with pale yellow sapwood composed of two or three layers of annual growth only; it contains numerous obscure medullary rays, the layers of annual growth being clearly marked by two or three rows of large open ducts. The specific gravity of the absolutely dry wood is 0.7333, a cubic foot weighing 45.70 pounds. It is extensively used in shipbuilding,[2] for all sorts of posts, and other purposes where durability in contact with the ground is sought, in construction and in turnery. It is preferred to the wood of any other North American tree for treenails, and was once largely exported in this form; and it is excellent fuel, burning slowly with a clear bright flame.[3]

[1] Engelmann, who explored this region fifty years ago and before it had been invaded by settlers, through whose agency *Robinia Pseudacacia* has become so widely scattered in the United States, first noticed it west of the Mississippi River growing, as he always believed, indigenously. In the trans-Mississippi region it does not, except in cultivation, attain a large size, and is usually a low shrub.

It is probable that the Indians of Virginia, who knew the value of the wood of the Locust and made their bows from it, carried the tree from the mountains into the low country, and so helped to spread it beyond the limits of its native forests. It appears to have been common in the neighborhood of the coast when Virginia was first settled by Europeans. William Strachey, who visited the colony on James River in 1610 and printed the first mention of this tree, found that "by the dwellings of the salvages are bay-trees, wild roses and a kynd of low tree, which beares a cod like to the peas, but nothing so big: we take yt to be locust." (*Historie of Travaile into Virginia Britannia*, ed. Major, 130.) The Indians, he tells us, made "their bows of some plant, eyther of the locust-tree or of weech." (*Ibid.* 105.)

The English in Virginia soon learned the value of Locust timber, for, "being obliged to run up with all the expedition possible such little houses as might serve them to dwell in, till they could find leisure to build larger and more convenient ones, they erected each of their little hovels on four only of these trees (the Locust-tree of Virginia), pitched into the ground to support the four corners: many of these posts are yet standing, and not only the parts underground, but likewise those above, still perfectly sound." (Mark Catesby, *Hortus Britanno-Americanus*, 34. London, 1763.)

[2] Mr. Ebenezer Jessup, writing to the *Gentleman's Magazine* in 1791, proposed a scheme for planting the Locust on a large scale in the New Forest with the idea of supplying the British navy with timber, its value in shipbuilding being well established at this time. (xi. 699.) Locust treenails, according to Loudon (*Arb. Brit.* ii. 719), sold in Philadelphia, in 1819, at ten dollars a thousand, and fifty to one hundred thousand were annually exported from that city alone to England.

[3] Mathieu, *Flore Forestière*, ed. 3, 108.

The bark of the root is tonic, or in large doses purgative and emetic,[1] and is used in homœopathic remedies.[2]

Robinia Pseudacacia was introduced into Europe early in the seventeenth century,[3] and was planted in the Jardin du Roi in Paris by Vespasien Robin in 1636.[4] The first description of the tree was published by John Parkinson in 1640 in the *Theatrum Botanicum*.[5]

No other North American tree has been so generally planted for timber and ornament in the United States[6] and in Europe;[7] and no inhabitant of the American forest has been the subject of so voluminous a literature.[8] Numerous varieties have appeared in nurseries marked by peculiarities of foliage, of habit, and of the color of the flowers, and are esteemed wherever the Robinia can be successfully grown.[9]

[1] Griffith, *Med. Bot.* 238, f. 123.—*U. S. Dispens.* ed. 14, 1746.—*Nat. Dispens.* ed. 2, 1231.—Lawrence Johnson, *Man. Med. Bot. N. Am.* 132.

[2] Millspaugh, *Am. Med. Pl. in Homœopathic Remedies*, i. 50, t. 50.

[3] It is impossible to establish the exact date of the introduction of the Locust-tree into Europe. Some authors, including Linnæus, the editors of the last edition of *Miller's Dictionary*, and those of the *Nouveau Duhamel*, fix it as 1601 when Jean Robin is said to have obtained seeds from America: others, including Adanson and Deleuze, state that it was not until 1636 that the Locust reached Paris, and that the honor of its introduction belongs to Vespasien and not to Jean Robin. It is not improbable that the Locust may have been cultivated in England as early or earlier than in France. According to Parkinson, whose work was published only five years after Vespasien Robin planted his tree in Paris, the Locust had been raised near London by Tradescant "to an exceeding great height."

[4] The tree planted by Vespasien Robin in Paris in 1636 is still living in the gardens of the Museum d'Histoire Naturelle. (See *Revue Horticole*, 1873, 152, f. 16.—*Garden and Forest*, iii. 305, f.)

[5] *Arbor siliquosa Virginiensis spinosa, Locus nostratibus dicta*, 1550.

Acacia Virginiana siliquis glabris, Ray, *Hist. Pl.* ii. 1719.

Acaciæ affinis Virginiana spinosa, siliqua membranacea plana, floribus albis papilionaceis. Anagyridis modo in Uvam propendentibus, Plukenet, *Phyt.* t. 73, f. 4; *Alm. Bot.* 6.

Pseudo-Acacia siliquis glabris, Boerhaave, *Hort. Lugd. Bat.* ii. 39.

Robinia aculeis geminatis, Linnæus, *Hort. Cliff.* 354.—Royen, *Fl. Leyd. Prodr.* 372.—Clayton, *Fl. Virgin.* 82.

Robinia pedunculis racemosis, foliis pinnatis, Linnæus, *Hort. Ups.* 212.—Clayton, *Fl. Virgin.* ed. 2, 105.

[6] The value of *Robinia Pseudacacia* is practically destroyed in nearly all parts of the United States beyond the mountain forests which are its home, by the borers which riddle the trunk and branches. Were it not for these insects it would be one of the most valuable timber-trees that could be planted in the northern and middle states. The character of the timber which it produces, the rapidity of its growth, its power to adapt itself to different soils and to reproduce itself rapidly by seeds which germinate readily, and by stump and root shoots, would make it a most valuable subject for forest and coppice-planting if it could be protected from insects. Young trees grow quickly and vigorously for a number of years, but soon become stunted and diseased, and rarely live long enough to attain any commercial value.

[7] No other American tree is so common in central and northern Europe, where *Robinia Pseudacacia*, although it never attains the size to which it grows in its native forests, now sometimes springs up spontaneously and appears to be naturalized. It is planted in great numbers for the decoration of parks and gardens, to protect railroad embankments, and to fix shifting sands, in coppice for the production of stakes and poles, and for the fodder furnished by the young growing shoots and leaves. (See a letter on the Acacia as a fodder plant in the *Gentleman's Magazine*, 1801, 1098.)

[8] Evelyn, *Silva*, 64, ed. Hunter, ii. 63.—Miller, *Dict.* No. 1.—Duhamel, *Traité des Arbres*, ii. 187, t. 42.—Aiton, *Hort. Kew.* iii. 53.—Bechstein, *Forstbot.* i. 265.—Naudin, *Manuel de l'Acclimateur*, 467.

Towards the end of the last century public attention in Europe was attracted to the value of the Robinia by a number of papers printed in the Transactions of scientific and horticultural societies; and in 1803 Monsieur N. François de Neufchateau, a senator and member of the Institute, published in Paris, under the title of *Lettre sur le Robinia connu sur le nom impropre de faux Acacia*, an octavo volume of three hundred and fourteen pages containing the essence of all that had been published about the tree in France, with much interesting information relating to its cultivation and its uses. A translation of a large part of this was published in 1842 in an English book on the Locust by W. Withers entitled, *The Acacia-tree: its Growth, Cultivation, and Uses.*

William Cobbett, the publicist, by his example and writings, did more than any one else to make known the value and extend the cultivation of the Locust-tree in the United States and in Europe. During an enforced residence in the United States, between the years 1817 and 1819, Cobbett devoted himself to farming on Long Island, and established a small nursery for the propagation of fruit and timber trees. Here he came to the conclusion "that nothing in the timber line could be so great a benefit as the general cultivation of the Locust." On his return to England he carried with him a package of the seeds and began the systematic raising and selling of Locust-trees, of which he sold more than a million. (See Cobbett, *Woodlands*, No. 323.—Loudon, *Arb. Brit.* ii. 609.)

[9] At least thirty varieties of *Robinia Pseudacacia* are recognized in gardens. The most distinct are,—

Var. *inermis*, De Candolle, *Cat. Hort. Monsp.* 136; *Prodr.* ii. 261.—Loudon, *Arb. Brit.* ii. 609. (*R. spectabilis*, Du Mont de Courset, *Bot. Cult.* vi. 140. *R. Utterharti*, *Hort.*—Verlot, *Rev. Hort.* 1873, 155.)

This only differs from the common Locust in the absence of stipular spines. It is this form which is usually planted in Europe for fodder. Grafted plants are used for this purpose, as the seedlings are often furnished with spines, which detract from the value of the fodder. Grown in good soil the Robinia furnishes two crops of shoots in the season.

Var. *umbraculifera*, De Candolle, *Cat. Hort. Monsp.* 137; *Prodr. l. c.*—Loudon, *l. c.* 610.—Koch, *Dendr.* i. 57.—Verlot, *l. c.* (*R. inermis*, Du Mont de Courset, *l. c.*)

The Parasol Acacia, as this variety is usually called, is character-

Robinia Pseudacacia is surpassed in beauty by few American trees. In no other are lightness and grace of foliage combined with such massiveness of trunk and spread of branches.[1] Few trees produce more abundant, beautiful, or fragrant flowers, or afford more pleasing contrasts of color in the light green of the youngest leaves with the darker hues of those of the earlier part of the season, and between the different shades of color of the upper and lower surfaces of the leaflets as they rise and fall with the slightest breath of air.[2]

ized by its short unarmed branches which form a compact spherical head. It is grafted either on tall stems of the common Robinia or on its own roots, and, although it does not produce flowers, is one of the most popular trees in the countries of central and northern Europe, where it is much used to decorate city and villa gardens and to shade highways, for which purpose its low wide-spreading head and dense foliage well adapt it. It is also used as a forage plant. (André, *Rev. Hort.* 1863, 347.)

Var. *crispa*, De Candolle, *Prodr.* ii. 261. — Verlot, *Rev. Hort.* 1873, 155.

A form in which the margins of the leaflets, especially those on the upper branches, are more or less undulate or crinkled.

Var. *tortuosa*, De Candolle, *l. c.* — Loudon, *Arb. Brit.* ii. 609. — Koch, *Dendr.* i. 57. — Verlot, *l. c.*

A form distinguished by the abnormal tortuous growth of the branches.

Var. *pyramidalis*, *Hort.* (*R. stricta*, *Hort.* *R. fastigiata*, *Hort.*)

A variety with upright branches forming a narrow pyramidal head which appeared in 1839 in the nursery of Monsieur A. Leroy at Angers. (Verlot, *l. c.*)

Var. *Decaisneana*, Carrière, *Rev. Hort.* 1863, 151, t. — *Fl. des Serres*, xix. t. 2027. — Lemaire, *Ill. Hort.* xii. t. 427. — Verlot, *l. c.*

A vigorous tree distinguished by its rose-colored flowers, which appeared in the nursery of Monsieur Villevelle at Manosque in France, where it flowered for the first time in 1862.

Var. *monophylla*, *Hort.*

A form in which the leaves are sometimes reduced to a single broad leaflet, or more often to two or three. This variety was obtained about 1855 by a French nurseryman, Monsieur Deniaux. (Verlot, *l. c.*)

Other distinct varieties sometimes found in gardens are var. *macrophylla* (Loddiges, *Cat.* 1830. — Loudon, *l. c.*); var. *microphylla* (Loddiges, *l. c.* — Loudon, *l. c.*); var. *pendula*, *Hort.*; var. *dissecta*, *Hort.*; and var. *latisiliqua*, *Hort.*, characterized by its large legumes. (Koch, *l. c.* — Verlot, *l. c.*).

[1] The brittleness of its branches is the only serious drawback to the Locust as an ornamental tree where it escapes the ravages of insects. In exposed situations they are often broken by the wind and the symmetry of the tree is injured. "It may ornament a garden, but is by no means qualified to adorn an exposed country. It depends on its beauty rather than on its grandeur, which is a quality more liable to injury." (Gilpin, *Forest Scenery*, ed. 2, i. 72.)

The Locust is less injurious than many other trees to plants growing under the shade of its branches, owing to the open character of the foliage and the fact that the leaflets fold together in wet weather and so allow the rain quickly to reach the ground beneath. (See Phillips, *Sylva Flor.* i. 47.)

[2] *Robinia Pseudacacia* continues to grow until the beginning of autumn, and the ends of the branches in summer are covered with young light yellow-green leaves which stand out conspicuously against the dark background of the older foliage.

EXPLANATION OF THE PLATES.

Plate CXII. Robinia Pseudacacia.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. Front view of a flower, natural size.
4. A staminal tube, enlarged.
5. Vertical section of a pistil, enlarged.
6. An ovule, much magnified.

Plate CXIII. Robinia Pseudacacia.

1. A fruiting branch, natural size.
2. A legume with one of the valves removed, natural size.
3. Vertical section of a seed, enlarged.
4. An embryo, enlarged.
5. A portion of a branch, the petiole removed and the bud covering laid open, showing the superposed naked buds, with a portion of a branchlet developed from a supra-axillary bud, enlarged.
6. A winter branchlet, natural size.

C.E.Faxon del. Picart fr. sc.

ROBINIA PSEUDACACIA, L.

A.Riocreux direx.t Imp.R.Taneur, Paris.

C.E. Faxon, del

Picart fr. sc.

ROBINIA PSEUDACACIA L.

A. Riocreux 'direx.t

Imp. R. Taneur, Paris.

ROBINIA NEO-MEXICANA.

Locust.

FLOWERS pale rose-colored, in short crowded glandular-hispid racemes. Legume glandular-hispid. Branches naked.

Robinia Neo-Mexicana, Gray, *Mem. Am. Acad.* n. ser. v. 314 (*Pl. Thurber.*). — Torrey, *Pacific R. R. Rep.* iv. 79; *Bot. Mex. Bound. Surv.* 53. — Walpers, *Ann.* iv. 491. — Watson, *King's Rep.* v. 419. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 56. — Coulter, *Man. Rocky Mt. Bot.* 59.

A small tree, sometimes twenty or twenty-five feet in height, with a slender trunk six or eight inches in diameter; or more often a low shrub. The bark of the trunk is thin, slightly furrowed, and light brown, the surface separating into small plate-like scales. The branchlets when they appear are pale and coated with rusty brown glandular hairs which increase in length during the summer and do not disappear until the autumn. In winter the branchlets of the previous season are slightly puberulous, bright reddish brown, often covered with a glaucous bloom, and marked by a few scattered small pale lenticels. The winter-buds are minute, depressed-globular, and protected by a scale-like covering coated with dark brown tomentum. The leaves vary from six to twelve inches in length, and are composed of from fifteen to twenty-one leaflets borne on a stout pubescent petiole grooved on the upper side and enlarged at the base. The leaflets are elliptical-oblong, mucronate, rounded, or sometimes slightly emarginate at the apex, usually wedge-shaped or sometimes rounded at the base, an inch and a half long and an inch broad; at first they are coated on the lower surface and the margins with soft brown hairs, and on the upper surface with silvery white pubescence; and at maturity they are thin, pale blue-green, conspicuously reticulate-veined, with slender midribs and primary veins, and quite glabrous with the exception of the lower side of the midribs and the stout petiolules, which are slightly puberulous. The stipules are chartaceous when they appear, and are covered with long silky brown hairs, which also form a tuft at their apex; at maturity they become stout slightly recurved flat brown or bright red spines sometimes an inch or more in length.[1] The stipels are membranaceous, a quarter of an inch long, often recurved, and sometimes do not disappear until the end of the season. The flowers, which are an inch in length, appear in May in short compact many-flowered glandular-hispid racemes with stout peduncles. The pedicels are slender, half an inch long, and, like the exterior of the calyx, covered with stout glandular hairs. The corolla is pale rose-colored or sometimes almost white, with a broad standard and wing-petals. The legume is three or four inches long with a narrow wing, and is covered with stout glandular hairs and conspicuously tipped with the remnants of the recurved style. The seeds are very dark brown, slightly mottled, and a sixteenth of an inch or rather more in length.

Robinia Neo-Mexicana inhabits the banks of mountain streams from the valley of the Purgatory River in Colorado, through northern New Mexico to the Santa Catalina and the Santa Rita Mountains in Arizona, where it occurs at elevations varying from four thousand to seven thousand feet above the sea-level, and to southern Utah, where it has been found near Kanah and in Mt. Zion Cañon of the west fork of the Rio Virgen. Only in the valley of the Purgatory River near Trinidad in Colorado is it known to grow into a small tree.

The wood of *Robinia Neo-Mexicana* is heavy, exceedingly hard, strong, and close-grained, with a satiny surface; it contains many evenly distributed open ducts and thin conspicuous medullary rays.

[1] The stipular spines of this species, which inhabits an arid region where plants require special protection from browsing animals and are usually well armed against them, are more constantly developed and generally much larger than those of the other Robinias.

It is yellow streaked with brown, with a light yellow sapwood composed of four or five layers of annual growth. The specific gravity of the absolutely dry wood is 0.8034, a cubic foot weighing 50.07 pounds.

Robinia Neo-Mexicana was discovered in May, 1851, by Dr. George Thurber, the botanist of the United States and Mexican Boundary Survey Commission, on a dry hillside in the valley of the Mimbres River in New Mexico, and was introduced into cultivation through the Arnold Arboretum in 1882. It is perfectly hardy in New England, where it grows rapidly and vigorously.[1]

[1] The largest plants in the Arboretum are ten or twelve feet high but have not yet flowered. Dr. G. Dieck reports that the plant in his Arboretum at Zoeschen, in Germany, produced flowers in the spring of 1891 (*Gartenflora*, 1891, 362).

EXPLANATION OF THE PLATE.

PLATE CXIV. ROBINIA NEO-MEXICANA.

1. A flowering branch, natural size.
2. A calyx, enlarged.
3. A flower, the calyx and corolla removed, enlarged.
4. A pistil, enlarged.
5. A raceme of fruit, natural size.
6. A legume with one valve removed, natural size.
7. Vertical section of a seed, enlarged.
8. An embryo, much magnified.
9. A winter branchlet, natural size.

C.E. Faxon del. Picart fr. sc.

ROBINIA NEO-MEXICANA, Gray.

A. Riocreux direx.t Imp. R. Taneur, Paris.

ROBINIA VISCOSA.

Clammy Locust.

FLOWERS pale rose-colored, in crowded oblong racemes. Legume glandular-hispid. Branches and petioles clammy.

Robinia viscosa, Ventenat, *Hort. Cels*, 4, t. 4; *Mém. de l'Inst. Nat. Sci. Phys. & Math.* v. 114. — Cels, *Mém. de l'Inst. Nat. Sci. Phys. & Math.* v. 110. — Willdenow, *Spec.* iii. 1131; *Enum.* 769; *Berl. Baumz.* 372. — Michaux, *Fl. Bor.-Am.* ii. 65. — *Nouveau Duhamel*, ii. 64, t. 17. — Poiret, *Lam. Dict.* vi. 222. — B. S. Barton, *Bot.* Appx. 29, t. 21. — Persoon, *Syn.* ii. 311. — Desfontaines, *Hist. Arb.* ii. 302. — Michaux f. *Hist. Arb. Am.* iii. 262, t. 2. — Pursh, *Fl. Am. Sept.* ii. 488. — Nuttall, *Gen.* ii. 118. — Hayne, *Dendr. Fl.* 140. — Elliott, *Sk.* ii. 242. — De Candolle, *Prodr.* ii. 262. — Guimpel, Otto & Hayne, *Abbild. Holz.* 81, t. 65. — Sprengel, *Syst.* iii. 247. — Don, *Gen. Syst.* ii. 238. — Spach, *Hist. Vég.* i. 260. — Torrey & Gray, *Fl. N. Am.* i. 295. — Dietrich, *Syn.* iv. 1053. — Chapman, *Fl.* 94. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 49. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 56. — Watson & Coulter, *Gray's Man.* ed. 6, 134.

Robinia glutinosa, Sims, *Bot. Mag.* t. 560. — Koch, *Dendr.* i. 59.

A small tree, thirty or forty feet in height, with a trunk ten or twelve inches in diameter, and slender spreading branches; or a low shrub five or six feet in height. The bark of the trunk is an eighth of an inch thick, smooth, and dark brown tinged with red. The branchlets are dark reddish brown during their first season, and clothed with conspicuous dark glandular hairs, which, like those on the petioles and legumes, exude a clammy, sticky substance;[1] during their first winter they are bright red-brown covered with small black lenticels and very sticky, and in their second year turn light brown and become dry. The winter-buds, which are minute and protected by a scale-like covering, are immersed in the scars left by the leaves of the previous season, and do not appear until the beginning of growth in the spring. The leaves are from seven to twelve inches long, with stout nearly terete dark petioles slightly enlarged at the base, and from thirteen to twenty-one leaflets which are ovate or sometimes acuminate, mucronate, rounded, or pointed at the apex, and wedge-shaped at the base. As they unfold the lower surface is covered with soft silky white pubescence, and the upper surface is slightly puberulent; at maturity they are an inch and a half to two inches long, two thirds of an inch broad, dark green and glabrous above, and pale and coated with pubescence below, especially along the slender yellow midribs and primary veins and on the stout glandular-hispid petiolules. The stipules are subulate, chartaceous, and often deciduous or sometimes develop into stout slender spines. The stipels are very slender, and disappear soon after the leaf has reached its full size. The flowers, which are two thirds of an inch long, appear in June[2] in short ovate crowded grandular-hispid racemes, and are almost inodorous. The slender pedicels are covered with long pale hairs, and are developed from the axils of large lanceolate acuminate dark red bracts contracted at the apex into long setaceous points which are exserted beyond the flower-buds, and mostly fall before the flowers open. The calyx is dark red and covered on the outer surface and on the margin of the subulate lobes with long pale hairs. The corolla is pale rose or flesh color, with a narrow standard marked on the inner surface by a pale yellow blotch, and broad side petals. The legume is linear-lanceolate, narrow winged, from two to three and a half inches in length, and tipped with the remnants of the long slender style. The seed is an eighth of an inch long, dark reddish brown and mottled.

[1] See an article by the French chemist Vauquelin (*Mém. de l'Inst. Nat. Sci. Phys. & Math.* v. 105), entitled *Expériences sur la substance visqueuse qui se rassemble sur l'écorce du Robinia viscosa.*

[2] A second crop of flowers is often produced in August from shoots developed early in the summer, especially on vigorously growing young trees or in years of abundant rainfall.

Robinia viscosa inhabits the high mountains of Carolina, and has now become naturalized through cultivation in many parts of the United States east of the Mississippi River and as far north as eastern Massachusetts.[1]

The wood[2] of *Robinia viscosa* is heavy, hard, and close-grained, with several rows of open ducts clearly marking the layers of annual growth, and many thin medullary rays. It is brown with light yellow sapwood composed of two or three thick layers of annual growth. The specific gravity of the absolutely dry wood is 0.8094, a cubic foot weighing 50.44 pounds.

Robinia viscosa was first noticed by William Bartram[3] in the summer of 1776 on the mountains between the headwaters of the Savannah and Tennessee rivers.[4] It was next found by the French botanist Michaux[5] in 1790 in the same region, and was introduced by him into his garden near Charleston, from which he sent it the next year to his son in Paris. It was first planted in Europe by the French physician Lemonnier[6] in his garden at Montreuil.[7] The excellent habit of the Clammy Locust, its handsome foliage and beautiful flowers, soon attracted the attention of horticulturists, and it has always been a popular garden plant in the United States and in Europe.[8]

[1] *Robinia viscosa*, which appears to be one of the rarest of all our trees, was not seen growing wild in the forests of the southern Alleghany Mountains from the time of the Michaux until 1882, when it was rediscovered by Mr. John Donnell Smith near Highlands, Macon County, North Carolina, covering a rocky slope known as Buzzard Ridge at an elevation of four thousand five hundred feet above the sea-level, and growing as a shrub with stems only a few feet high. It has not been seen in any other locality growing wild. Bartram and Michaux speak of it as a tree forty feet high, and it often attains that height in cultivation.

[2] Taken from a cultivated tree growing in Essex County, Massachusetts.

[3] See i. 16.

[4] *Trav.* 335.

[5] See i. 58.

[6] Louis Guillaume Lemonnier (1717–1799), brother of the astronomer, Pierre Louis Lemonnier, a distinguished Parisian physician, was appointed on the death of Bernard de Jussieu in 1777 professor of botany in the Jardin du Roi, which he is said to have greatly enriched. He soon after abandoned his chair in favor of Antoine Louis de Jussieu and was appointed first physician to Louis XVI. Ruined by the Revolution, Lemonnier retired to Montreuil, where he opened a small shop for the sale of herbs, and in his garden cultivated many American plants given to him by his friends, the two Michaux, passing in these occupations what he declared were the happiest days of his life. His publications relating to plants are not numerous or important. They include a *Lettre sur la Cultivation du Café* (Paris, 1773) and a few short memoirs. *Monnieria*, a name given by Linnæus to an annual plant of tropical America, preserves the memory of this modest and public-spirited man of science, to whose value, according to the testimony of his contemporaries, scant justice is done in the published results of his observations.

[7] Michaux f. *Hist. Arb. Am.* iii. 264.

[8] Aiton, *Hort. Kew.* ed. 2, iv. 323. — Loudon, *Arb. Brit.* ii. 626, f. 306, v. t. 87.

Robinia bella-rosea, *Hort.*, a plant sometimes found in gardens with usually glabrous leaflets, rose-colored flowers, and red branches without glandular hairs, is perhaps a hybrid between this species and *R. Pseudacacia*. (Nicholson, *Dict. Gard.*) *Robinia dubia* (Desvaux, *Jour. Bot.* iv. 204) was considered by De Candolle (*Prodr.* ii. 261) a garden hybrid of similar parentage.

EXPLANATION OF THE PLATE.

Plate CXV. Robinia viscosa.

1. A flowering branch, natural size.
2. A flower, front view, natural size.
3. A staminal tube, the upper stamen detached, enlarged.
4. A pistil, enlarged.
5. Vertical section of a pistil, enlarged.
6. A raceme of fruit, natural size.
7. A legume, one of the valves removed, natural size.
8. Vertical section of a seed, enlarged.
9. An embryo, much magnified.

C.E. Faxon, del. Picart fr. sc.

ROBINIA VISCOSA, Vent.

A. Riocreux direx.t. Imp. R. Taneur, Paris.

OLNEYA.

FLOWERS in short axillary racemes; calyx subcampanulate, 5-lobed, the lobes imbricated in æstivation; corolla papilionaceous; ovary many-ovuled. Legume compressed, thick-valved, tardily dehiscent. Leaves pinnate, destitute of stipules.

Olneya, Gray, *Mem. Am. Acad.* n. ser. v. 328 (*Pl. Thurber.*). — Bentham & Hooker, *Gen.* i. 500. — Baillon, *Hist. Pl.* ii. 271.

A small tree, with thin scaly bark and stout terete hoary-canescent, slightly many-angled branchlets often armed with stout infrastipular spines. Leaves hoary-canescent, persistent, equally or unequally pinnate, ten to fifteen-foliolate, destitute of stipules and stipels, short-petiolate, often fascicled in former axils; leaflets cuneate, oblong or obovate, entire, obtuse, often mucronate, rigid, short-petiolulate, reticulate-veined, with broad conspicuous midribs. Flowers in short axillary few-flowered hoary-canescent racemes. Bracts and bractlets chartaceous, acute, minute, deciduous before the expansion of the flowers. Pedicels stout, as long as or rather longer than the calyx. Calyx hoary-canescent with short thick pubescence, the lobes ovate, obtuse, almost equal, the two upper connate for the greater part of their length. Disk cupuliform, adnate to the tube of the calyx. Corolla papilionaceous; petals unguiculate, purple, or violet, inserted on the disk; standard orbicular, deeply emarginate, reflexed, furnished at the base of the blade with two infolded ear-shaped appendages covering two prominent callosities; wings oblique, oblong, slightly auriculate at the base of the blade on the upper side, free, as long as the broad obtuse incurved keel-petals. Stamens ten, diadelphous, the superior one free, filling the slit in the staminal tube; filaments filiform, of the same length; anthers uniform, attached on the back, two-celled, the cells opening longitudinally. Ovary sessile or slightly stipitate, pilose, many-ovuled; style inflexed, bearded above the middle; stigma thick and fleshy, depressed-capitate; ovules suspended from the inner angle of the ovary, superposed, amphitropous, the micropyle superior. Legume oblique, compressed, glandular-hairy, light brown, two-valved, often tipped with the remnants of the long persistent style, one to five-seeded; valves thick and coriaceous, unequally and interruptedly convex at maturity by the growth of the seeds. Seeds broadly ovate, slightly angled on the ventral side, estrophiolate, suspended by short thick funicles, destitute of albumen; testa thin, membranaceous, bright chestnut-brown and lustrous. Embryo filling the cavity of the seed; cotyledons thick and fleshy, accumbent on the short incurved radicle, light green.

The wood of Olneya is very heavy, hard, and strong, although brittle. The character of the grain, which is usually contorted, although it increases its beauty, renders it difficult to cut and work. It is rich dark brown striped with red, with thin clear yellow sapwood, and contains numerous thin medullary rays. The specific gravity of the absolutely dry heartwood is 1.1486, a cubic foot weighing 66.07 pounds. It furnishes excellent fuel, and is sometimes manufactured into canes and other small objects.

Olneya was discovered in July, 1852, by Dr. George Thurber, the botanist of the United States and Mexican Boundary Survey Commission, on the table-lands of the valley of the lower Gila River in what is now the Territory of Arizona.

The generic name commemorates the services to botany of Stephen T. Olney.[1] The genus is represented by a single species.

[1] Stephen Thayer Olney (1812–1878) was a native of Providence, Rhode Island, where he was actively engaged during nearly his entire life in business and manufacturing enterprises which left him, however, the opportunity to indulge his taste for botany, and to collect a large and rich herbarium and botanical library which he bequeathed to Brown University, and to study critically the plants of his native State. He published a catalogue of these in 1845, with continuations and emendations in 1846 and 1847; and in 1871 a *List of Rhode Island Algæ*. Mr. Olney was president of the Providence Franklin Society from 1859 to 1869.

OLNEYA TESOTA.

Iron Wood. Arbol de Hierro.

Olneya Tesota, Gray, *Mem. Am. Acad.* n. ser. v. 313 (*Pl. Thurber.*); *Ives' Rep.* 11. — Torrey, *Pacific R. R. Rep.* iv. 82; vii. 10, t. 5; *Bot. Mex. Bound. Surv.* 58. — Walpers, *Ann.* iv. 587. — Cooper, *Smithsonian Rep.* 1858, 265. — Brewer & Watson, *Bot. Cal.* i. 157. — Hemsley, *Bot. Biol. Am. Cent.* i. 260. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 56.

Tesota, Mueller, *Walp. Ann.* iv. 479.

Olneya Tesota sometimes grows to the height of twenty-five or thirty feet, with a short trunk occasionally eighteen inches in diameter and usually divided, four or six feet from the ground, into a number of stout upright branches. The bark of the trunk exfoliates in long longitudinal dark red-brown scales. The branchlets are at first thickly coated with hoary-canescent pubescence which disappears early in their second year, when they are pale green and more or less spotted and streaked with red, becoming pale brown in their third season. The spines, which are often developed in pairs below the leaves, are straight or slightly curved, very sharp and rigid, from an eighth to a quarter of an inch in length, and persistent during at least two years. The leaves are from one to two and a half inches in length, with grooved petioles, and leaflets which are from half to three quarters of an inch long. They appear with the flowers early in June, those of the previous year apparently falling at the same time. The fruit, which is light brown and very glandular, is fully grown in midsummer and ripens before the end of August.

Olneya Tesota is widely distributed through the arid regions of the southwestern part of the continent, from the valley of the Colorado River south of the Mohave Mountains of California to southwestern Arizona, the adjacent portions of Sonora, and Lower California.[1] It occupies the sides of low depressions and arroyos in the desert, and in some portions of its range, especially in Sonora, where it is more abundant and grows to a larger size than in any part of the United States, it is a common tree. No other desert tree is more beautiful than the Tesota when its abundant racemes of large bright flowers are clustered on the end of the branches; and in recent years a number of attempts have been made to introduce it into the gardens of southern Europe, where, however, it has resisted every effort at domestication.[2]

The specific name *Tesota* is that by which this tree, the Arbol de Hierro of the Spaniards in Mexico, was known to the inhabitants of Sonora at the time of its discovery.

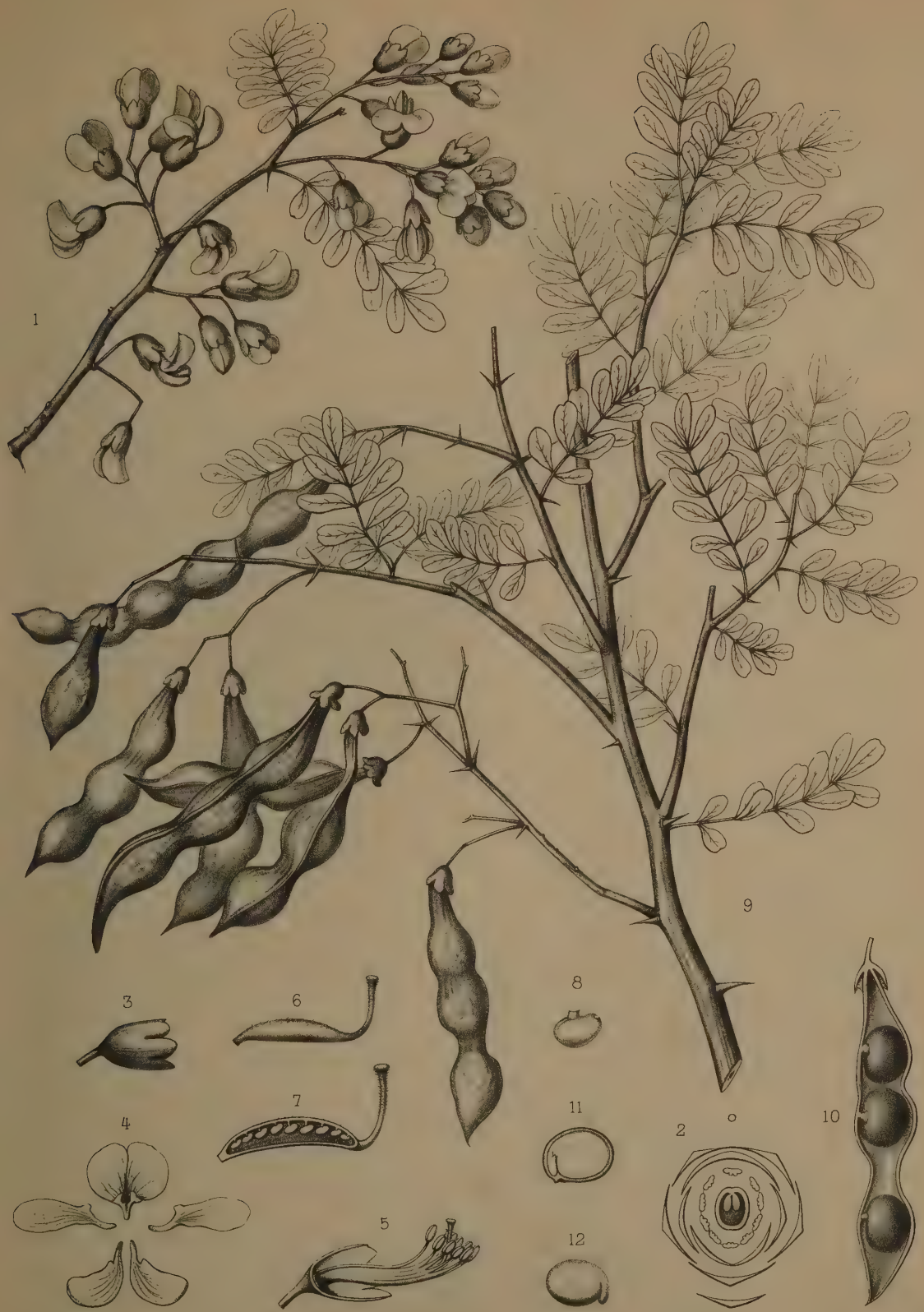
[1] It was found in Lower California by T. S. Brandegee between Comondu and Calamujuet (*Proc. Cal. Acad.* ser. 2, ii. 149 [*Pl. Baja Cal.*]).

[2] The seed germinates readily, but the seedling plants soon become sickly, and perish at the end of a few weeks (Naudin, *Garden and Forest*, iv. 324).

EXPLANATION OF THE PLATE.

Plate CXVI. Olneya Tesota.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A calyx, enlarged.
4. The petals of a flower displayed, enlarged.
5. A flower, the corolla and part of the calyx removed, enlarged.
6. A pistil, enlarged.
7. Vertical section of an ovary, enlarged.
8. An ovule, much magnified.
9. A fruiting branch, natural size.
10. A legume, one of the valves removed, natural size.
11. Vertical section of a seed, natural size.
12. An embryo, enlarged.



C.E Faxon del. Picart fr. sc.

OLNEYA TESOTA, Gray.

A. Riocreux direx.t, Imp. R. Taneur, Paris.

ICHTHYOMETHIA.

FLOWERS in ample axillary panicles; calyx 5-lobed, the lobes imbricated in æstivation; corolla papilionaceous; ovary 10 to 12-ovuled. Legume linear, longitudinally 4-winged, indehiscent. Leaves alternate, unequally pinnate, destitute of stipules.

Ichthyomethia, Browne, *Nat. Hist. Jam.* 296.
Piscidia, Linnæus, *Syst. Nat.* ed. 10, 1155; *Gen.* ed. 6, 367. — Adanson, *Fam. Pl.* ii. 326. — A. L. de Jussieu, *Gen.* 358. — Meisner, *Gen.* 89. — Endlicher, *Gen.* 1305. — Bentham & Hooker, *Gen.* i. 550. — Baillon, *Hist. Pl.* ii. 327.

A tree, with red-brown scaly bark and stout terete branchlets marked with many pale lenticular spots. Buds obtuse, their thin scales clothed with silky rufous hairs. Leaves alternate, long-petiolate, five to eleven-foliolate, deciduous; leaflets opposite, the terminal one distant from the others, oval, obovate, or broadly oblong, obtuse or shortly acuminate at the apex, rounded or wedge-shaped at the base, with undulate thickened margins and thick pubescent petiolules, at first coated like the petioles and young branchlets with rufous hairs, at maturity coriaceous and then glabrous and dark green on the upper surface, pale and more or less covered with rufous or canescent pubescence along the elevated conspicuous midribs and primary veins on the lower surface, otherwise glabrous or sometimes covered with soft silky pubescence. Flowers in axillary canescent ovate densely flowered or elongated thyrsoidal panicles with short three to twelve-flowered branches, developed from the naked branchlets of the previous year. Pedicels slender, enlarged at the two extremities, bibracteolate. Bracts minute, caducous. Bractlets minute, scarious, subelliptical, slightly coriaceous. Calyx campanulate, canescent, five-lobed, persistent, the lobes short and broad, the two upper subconnate, the lower broadly triangular. Petals inserted on an annular glandular disk adnate to the interior of the calyx-tube, unguiculate, white tinged with red; standard nearly orbicular, emarginate, hoary-canescent on the outer, marked with a green blotch on the inner surface, the claw as long as the calyx; wings oblong-falcate, auriculate at the base of the blade on the upper side; keel-petals broadly falcate, the claws connate. Stamens ten, the filament of the upper one free at the base only, connate above with the others into a closed tube; anthers uniform, versatile, two-celled, the cells opening longitudinally. Ovary sessile, sericeous, many-ovuled, contracted into a filiform incurved style terminated by the capitate stigma; ovules suspended from the inner angle of the ovary, two-ranked, amphitropous, the micropyle superior. Legume linear-compressed, raised on a stalk longer than the calyx, many-seeded, slightly contracted between the seeds, tomentose-canescent or glabrate, thin walled, indehiscent, longitudinally four-winged; the wings developed from the dorsal and ventral sutures, broad, continuous or interrupted by the abortion of some of the ovules, membranaceous, softly pubescent, laterally many-veined, their margins undulate or irregularly cut. Seed oval, compressed, destitute of albumen, laterally attached by a short thick funicle; testa thin, crustaceous, red-brown, not lustrous. Embryo filling the cavity of the seed; cotyledons plano-convex, oval, fleshy; radicle short, inflexed.

The wood of Icthyomethia is very heavy, hard, and close-grained, although not strong, with a fine surface susceptible of taking a beautiful polish; it is clear yellow-brown, with thick lighter colored sapwood, and is extremely durable in contact with the ground. The specific gravity of the absolutely dry wood is 0.8734, a cubic foot weighing 54.43 pounds. It is largely used in Florida in boat-building and for firewood and charcoal.

Icthyomethia, especially the bark of the roots, contains an active principle, *Piscidin*, which is

sedative and hypnotic, and has been found effective in producing sleep without subsequent injurious effects, although inferior to opium as an analgesic. The fluid extract of the bark of the root locally applied has been successfully employed in alleviating toothache, or, taken internally, in relieving pain.[1] The bark of the roots, with the young branches and powdered leaves, has been used in the West Indies from the time of the Caribs to stupefy fish and facilitate their capture.[2]

The generic name, formed from ἰχθύς and μέθη, indicates the Carib use of the tree. The genus is represented by a single species.

[1] Barham, *Hort. Amer.* 52. — Lindley, *Fl. Med.* 246. — William Hamilton, *Pharm. Jour.* iv. 76. — *U. S. Dispens.* ed. 14, 1734. — *The Pharmacology of the Newer Materia Medica*, 1890, 593, f.

[2] The earlier European travelers in the Antilles and South America describe the employment by the natives of Ichthyomethia and some allied leguminous trees for this purpose. The first mention of the custom appears in Oviedo y Valdes's *Historia Natural y General de las Indias*, published in 1535, in which this passage occurs : —

"Y tambien usan de cierta hierva que se dice baygua, en lugar de belesa ò barbasco : . . . Esta baygua es como bexuco, é picada é maxada aprovecha para embarbascar é adormecer el pescado, como he dicho." (Lib. xiii. cap. i.)

It is probably the *Bois à Ennyurer les Poissons* of Du Tertre (*Hist. Gen. des Iles de Saint Christophe*, etc., 216) and of Labat (*Nouveau Voyage aux Isles de l'Amérique*, i. 418).

Rochefort speaks of it as "celuy dont la racine étant broyée, & jettée dans les rivieres, enyure les Poissons." (*Histoire Naturelle et Morale des Isles Antilles*, 103.)

ICHTHYOMETHIA PISCIPULA.

Jamaica Dogwood.

Ichthyomethia Piscipula, A. S. Hitchcock, *Garden and Forest*, iv. 472.

Erythrina Piscipula, Linnæus, *Spec.* 707.

Piscidia Erythrina, Linnæus, *Syst. Nat.* ed. 10, 1155; *Spec.* ed. 2, 993. — Jacquin, *Enum. Pl. Carib.* 27; *Stirp. Am.* 209; *Hist. Select. Stirp. Am.* 102. — Miller, *Dict.* ed. 8, No. 1. — Swartz, *Obs.* 276. — Lamarck, *Dict.* i. 433. — Willdenow, *Spec.* iii. 919. — Titford, *Hort. Bot. Am.* 84. — Lunan, *Hort. Jam.* i. 269. — Kunth, *Syn.* iv. 73. — Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 382. — De Candolle, *Prodr.* ii. 267. — Poiret, *Lam. Dict. Ill.* iii. 163, t. 605. — Sprengel, *Syst.* iii. 228. — Descourtilz, *Fl. Med. Antil.* iii. 203, t. 196. — Spach, *Hist. Vég.* i. 266. — Don, *Gen. Syst.* ii. 242. — Macfadyen, *Fl. Jam.* 258. — Nuttall, *Sylva*, ii. 31, t. 52. — Dietrich, *Syn.* iv. 1224. — Bentham, *Jour. Linn. Soc.* iv. Suppl. 116; *Bot. Voy. Sulphur*, 81. — Chapman, *Fl.* 110. — Grisebach, *Fl. Brit. W. Ind.* 200. — Hemsley, *Bot. Biol. Am. Cent.* i. 319. — Sauvalle, *Fl. Cub.* 32. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 57.

P. **Carthagenensis**, Jacquin, *Enum. Pl. Carib.* 27; *Stirp. Am.* 210; *Hist. Select. Stirp. Am.* 103. — Linnæus, *Spec.* ed. 2, 993. — Willdenow, *Spec.* iii. 920. — Lunan, *Hort. Jam.* i. 270. — De Candolle, *Prodr.* ii. 267. — Sprengel, *Syst.* iii. 228. — Don, *Gen. Syst.* ii. 242. — Spach, *Hist. Vég.* i. 266. — Macfadyen, *Fl. Jam.* 259. — Dietrich, *Syn.* iv. 1224.

P. **Piscipula**, Sargent, *Garden and Forest*, iv. 436.

A tree, forty or fifty feet in height, with a trunk often two or three feet in diameter and stout upright-growing sometimes contorted branches forming an irregular head. The bark of the trunk is an eighth of an inch thick, with a light red-brown surface which divides into small square scales. The branchlets when they first appear are coated with thick rufous pubescence which disappears during the summer, and in their first winter they are glabrous or glabrate, bright reddish brown, and conspicuously marked by oblong longitudinal lenticular white spots and large elevated leaf-scars. The leaves, which in Florida are deciduous in early spring, appear after the flowering period. They are from four to nine inches in length, with stout petioles slightly enlarged at the base, the rachis being sometimes extended for nearly an inch between the upper pair and the terminal leaflet. The leaflets are from three to four and a half inches in length and an inch and a half to nearly two inches in breadth, with thick petiolules half an inch long. The flowers are three quarters of an inch in length, and are borne on slender pedicels which are sometimes an inch and a half long, and which appear jointed from the prominent elevated persistent scars left by the falling of the bractlets. The flower-clusters are sometimes ten or twelve inches in length, with long graceful few-flowered branches, or often are not more than two to four inches long, compact, and densely flowered. They appear in Martinique in February, and in Florida in May; and as they are produced in great quantities near the ends of all the branches, the trees are handsome and conspicuous at the flowering time, although bare of leaves.[1] The fruit ripens in July and August, and is light brown, three or four inches long, and from an inch to an inch and a half across the thin papery wings.

Ichthyomethia Piscipula is one of the commonest of the tropical trees which grow in Florida, where it occurs on the shores of Bay Biscayne, on many of the southern keys, and on the west coast from the neighborhood of Pease Creek to Cape Sable. It abounds in many of the West India islands, and occurs in southern Mexico.

The earliest description of *Ichthyomethia Piscipula* was published in 1689 by Paul Hermann in his *Paradisi Batavi Prodromus*.[2]

[1] Baron Eggers notices (*Bull. U. S. Nat. Mus.* No. 13, 45) that only those individuals which are going to flower drop their leaves.

[2] *Coral arbor polyphylla non spinosa*, 329.

Phaseolo affinis Arbor Indica Coral dicta polyphyllos, non spinosa, foliis mollibus, subhirsutis, Plukenet, *Phyt.* t. 104, f. 3; *Alm. Bot.* 293.

Coral arbor polyphylla non spinosa fraxini folio, siliqua alis foliaceis extantibus, rotæ molendinariæ fluviatilis, vel seminum laserpitij instar, aucta, Sloane, *Cat. Pl. Jam.* 143; *Nat. Hist. Jam.* ii. 39, t. 176, f. 4, 5. — Ray, *Hist. Pl.* iii. *Dendr.* 108.

Pseudo-Acacia siliquis alatis, Plumier, *Cat.* 19.

According to Aiton[1] it was cultivated in England as early as 1690 in the Royal Gardens at Hampton Court.

Ichthyomethia Piscipula was first detected in Florida by Dr. J. L. Blodgett.[2]

Robinia pedunculis ramosis, siliquis membranaceis, Pl. Am. ed. Burmann, 229, t. 233, f. 2.

Robinia foliis impari-pinnatis, foliolis ovatis acuminatis, ramis nodosis glabris, pedunculis racemosis, Miller, *Dict.* ed. 7.

Ichthyomethia, foliis pinnatis ovatis, racemis terminalibus, siliquis quadrialatis, Browne, *Nat. Hist. Jam.* 296.

[1] *Hort. Kew.* iii. 9.

[2] See i. 33.

EXPLANATION OF THE PLATES.

Plate CXVII. Ichthyomethia Piscipula.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. The petals of a flower displayed, natural size.
4. Vertical section of a flower, enlarged.
5. A calyx, enlarged.
6. A flower, the corolla and part of the calyx removed, enlarged.
7. A pistil and part of the calyx, enlarged.
8. An ovule, much magnified.

Plate CXVIII. Ichthyomethia Piscipula.

1. A fruiting branch, natural size.
2. A fruit, a portion of one wall removed, natural size.
3. A seed, enlarged.
4. Vertical section of a seed, enlarged.
5. An embryo, much magnified.
6. A leaf, natural size.

C. E. Faxon del. Picart fr. sc.

ICHTHYOMETHIA PISCIPULA, Hitchcock.

A. Riocreux direx.t. Imp. R. Taneur, Paris.

C.E. Faxon del.

Picart fr sc

ICHTHYOMETHIA PISCIPULA, Hitchcock.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

CLADRASTIS.

FLOWERS in ample terminal panicles; calyx 5-toothed, the teeth imbricated in æstivation; corolla papilionaceous; stamens distinct; ovary stipitate, many-ovuled. Legume linear-compressed, tardily dehiscent. Leaves unequally pinnate, destitute of stipules.

Cladrastis, Rafinesque, *Neogen.* 1. — Endlicher, *Gen.* 1309. — Bentham & Hooker, *Gen.* i. 554 (excl. *Maackia*). — Baillon, *Hist. Pl.* ii. 361 (excl. *Maackia*).

A tree, with copious watery juice, smooth gray bark, slender slightly zigzag terete branchlets, infrapetiolar buds, and fibrous roots. Buds four together, superposed, flattened by mutual pressure into an acuminate cone, covered individually with thin lanceolate scales coated with lustrous brown tomentum, and inclosed collectively in the hollow base of the petiole, the largest and upper one only developing, the lowest minute and rudimentary. Leaves alternate, petiolate, the stout terete petioles abruptly enlarged at the base, seven to eleven-foliolate, deciduous; leaflets usually alternate, broadly oval, the terminal one rhomboid-ovate, contracted at the apex into a short, broad point, wedge-shaped at the base, entire, petiolulate, destitute of stipels, covered at first like the young shoots with fine silvery or on the midrib slightly rufous pubescence, at maturity thin, glabrous, dark yellow-green on the upper, and pale on the lower surface, the midribs and numerous primary veins conspicuous, deeply grooved above, light yellow below. Flowers in long graceful nodding terminal panicles, the lower branches racemose and often springing from the axils of solitary flowers, the main axis slightly zigzag, and, like the branches, covered at first with a glaucous bloom, and slightly pilose. Bracts lanceolate, scarious, early deciduous. Pedicels solitary, slender, puberulous, bibracteolate near the middle, the bractlets scarious, minute, caducous. Calyx cylindrical-campanulate, enlarged on the upper side, obliquely obconic at the base, puberulous within and without, the teeth nearly equal, short, and obtuse, the two upper subconnate. Disk cupuliform, adnate to the interior of the calyx-tube. Petals white, unguiculate; standard nearly orbicular, entire or slightly emarginate, reflexed above the middle, barely longer than the straight oblong wings, slightly bi-auriculate at the base of the blade, marked on the inner surface with a pale yellow blotch; keel-petals free, oblong, nearly straight, obtuse, slightly subcordate or bi-auriculate at the base. Stamens ten, free; filaments filiform, slightly incurved near the summit, glabrous; anthers attached on the back at the middle, versatile, two-celled, the cells opening longitudinally. Ovary linear, stipitate, bright red, villose with long pale hairs, many-ovuled, contracted into a long slender glabrous slightly incurved subulate style; stigma terminal, minute; ovules suspended from the inner angle of the ovary, superposed, amphitropous, the micropyle superior. Legume glabrous, short-stalked, linear-compressed, the upper margin slightly thickened, tipped with the remnants of the persistent style, four to six-seeded, ultimately dehiscent, the valves thin and membranaceous. Seed oblong-compressed, scarcely strophiolate, destitute of albumen, attached by a slender funicle; testa thin, membranaceous, dark brown. Embryo filling the cavity of the seed; cotyledons fleshy, oblong, flat; radicle short, inflexed.

The wood of Cladrastis is heavy, very hard, strong, and close-grained, with a smooth satiny surface capable of receiving a good polish, the layers of annual growth being clearly marked by several rows of open ducts. In color it is bright clear yellow changing to light brown on exposure, the thin sapwood being almost white. The specific gravity of the absolutely dry wood is 0.6278, a cubic foot weighing 39.12 pounds. It is used for fuel and occasionally for gun-stocks, and yields a clear yellow dye. The genus is not known to possess other useful properties.

Cladrastis was discovered in March, 1796,[1] by the French botanist Michaux,[2] near Fort Blount on the Cumberland River.[3]

The generic name, from κλάδος and θραυστός, relates to the brittleness of the branches. The genus is represented by a single species.[4]

[1] Michaux, *Jour.* in *Proc. Am. Phil. Soc.* xxvi. 135.

[2] See i. 58.

[3] A letter written by Michaux to William Blount, governor of the Ohio Territory, suggesting the value of the wood of this tree as a dyewood, was published in the *Knoxville Gazette* of March 15, 1796. (Michaux f. *Voyage à l'Ouest des Monts Alleghanys*, 255.)

[4] Maackia (Ruprecht, *Bull. Acad. St. Pétersbourg*, xv. 143, t. 1, f. 2), a small leguminous tree of the valley of the Amour River and of Japan, now well known in cultivation, was referred by Bentham (Bentham & Hooker, *Gen.* i. 554) to Cladrastis, from which, however, it appears generically distinct in its solitary extra-petiolar buds, accrescent bud-scales persistent on the base of the young shoots, and erect spicate inflorescence, geminate pedicels, four-toothed calyx, filaments connate at the base, the thickened suture of the pod, and in the character of its bark and its general habit. (See Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xviii. 400 [*Mél. Biol.* ix. 72].)

CLADRASTIS LUTEA.

Yellow Wood. Virgilia.

Cladrastis lutea, Koch, *Dendr.* i. 6. — Sargent, *Garden and Forest*, ii. 375.

Virgilia lutea, Michaux f. *Hist. Arb. Am.* iii. 266, t. 3. — Pursh, *Fl. Am. Sept.* i. 309. — Nuttall, *Gen.* i. 284. — Hayne, *Dendr. Fl.* 53. — Loiseleur, *Herb. Amat.* iii. t. 197. — De Candolle, *Prodr.* ii. 98. — Sprengel, *Syst.* iv. pt. ii. 171. — Don, *Gen. Syst.* ii. 112. — Spach, *Hist. Vég.* i. 163. — Dietrich, *Syn.* ii. 1501. — Loudon, *Arb. Brit.* ii. 565, t. 78.

C. tinctoria, Rafinesque, *Neogen.* 1; *Med. Fl.* ii. 210; *New Sylva*, iii. 83. — Torrey & Gray, *Fl. N. Am.* i. 391. — Walpers, *Rep.* i. 807. — Chapman, *Fl.* 113. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 57. — Watson & Coulter, *Gray's Man.* ed. 6, 127.

Cladrastis lutea is a tree, sometimes fifty or sixty feet in height, with a trunk from a foot and a half to two feet or exceptionally to four feet in diameter, usually divided six or seven feet from the ground into two or three stems, and rather slender wide-spreading more or less pendulous brittle branches forming a wide graceful head. The bark of the trunk varies from an eighth to a quarter of an inch in thickness and has a smooth silvery gray or light brown surface, while that of the branches is lighter colored. The branchlets are clothed with pubescence when they appear, but soon become glabrous, and during their first season are light brown tinged more or less with green, especially on the shaded side, very smooth and lustrous, and covered with numerous darker colored lenticels; during their first winter they are bright red-brown, still lustrous, and marked with large elevated leaf-scars surrounding the buds, and the following year are dark brown and less lustrous. The leaves, which appear in early spring, are eight to twelve inches long; the leaflets are three or four inches in length and an inch and a half to two inches in breadth, the terminal one rather shorter than the others and from three to three and a half inches broad. The leaves turn a bright clear yellow rather late in the autumn some time before falling. The flowers, which appear in the middle of June in panicles twelve or fourteen inches long and five or six inches broad, are slightly fragrant. The fruit, which is fully grown by the middle of August, ripens in September, when the legumes soon fall to the ground and then open, the seed germinating the following spring.

Cladrastis lutea is one of the rarest and most local of the trees of eastern North America; it is found on the limestone cliffs of the Kentucky and Dick Rivers in central Kentucky, in central Tennessee where, perhaps, in the neighborhood of Nashville it is more abundant and attains a larger size than elsewhere, and in a few localities on the western slopes of the high mountains of eastern Tennessee, and in Cherokee County, North Carolina. It generally grows in rich soil, often overhanging the banks of rapid streams, and its usual companions in the forest are the Black Walnut, the White Ash, the White Oak, the Mulberry, the Butternut, the Shellbark Hickory, and the Tulip Poplar.

Cladrastis lutea is one of the most beautiful flowering trees of the American forests. It was introduced into cultivation by the elder Michaux, and has become one of the most valued ornamental trees in the United States and in those parts of Europe where the summer sun is sufficiently hot to ripen the wood thoroughly and insure the free production of flowers which appear in profusion only in alternate years. It is hardy as far north as New England and the province of Ontario. Few insects prey on the handsome foliage of *Cladrastis lutea*;[1] fungal disease is unknown to it, and the brittleness of the branches, which are often broken by high winds, is the only objection to the Virgilia[2] as an ornament to the garden and the lawn, which it graces with the lightness of its port, its smooth delicate bark, rich and ample foliage, and handsome flowers.

[1] Occasionally leaf-eating insects and red spiders slightly injure this tree in cultivation.

[2] In cultivation *Cladrastis lutea* is almost universally known as Virgilia; it is also sometimes called Yellow Wood and Gopher Wood in the region where it naturally grows.

EXPLANATION OF THE PLATES.

Plate CXIX. Cladrastis lutea.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. The petals of a flower displayed, natural size.
4. Vertical section of a flower, natural size.
5. A stamen, natural size.
6. Vertical section of an ovary, natural size.
7. An ovule, magnified.

Plate CXX. Cladrastis lutea.

1. A fruiting branch, natural size.
2. A legume, one of the valves removed, natural size.
3. Vertical section of a seed, enlarged.
4. An embryo, enlarged.
5. A winter branchlet, natural size.

C.E. Faxon del.

Picart fr. sc.

CLADRASTIS LUTEA, C. Koch .

A. Riocreux dirext.

Imp. R. Taneur, Paris .

C.E. Faxon del. Picart fr. sc.

CLADRASTIS LUTEA, C Koch.

A. Riocreux direx^t Imp. R. Taneur, Paris.

SOPHORA.

FLOWERS in terminal simple racemes or leafy panicles, papilionaceous; calyx 5-toothed, the short teeth nearly equal, imbricated in æstivation; stamens free or rarely subconnate; ovary short-stalked, many-ovuled. Legume moniliform, indehiscent, or tardily dehiscent. Leaves unequally pinnate.

Sophora, Linnæus, *Gen.* 125. — Adanson, *Fam. Pl.* ii. 318. — A. L. de Jussieu, *Gen.* 352. — De Candolle, *Mém. Légum.* 166. — Endlicher, *Gen.* 1308. — Meisner, *Gen.* 80. — Bentham & Hooker, *Gen.* i. 555. — Baillon, *Hist. Pl.* ii. 358.

Broussonetia, Ortega, *Dec.* v. 61 (not Ventenat).

Edwardsia, Salisbury, *Trans. Linn. Soc.* ix. 298. — Meisner *Gen.* 80. — Endlicher, *Gen.* 1308.

Patrinia, Rafinesque, *Jour. Phys.* lxxxix. 97 (not A. L. de Jussieu).

Zanthyrsis, Rafinesque, *New Fl.* iii. 84.

Agastianis, Rafinesque, *New Fl.* iii. 85.

Styphnolobium, Schott, *Wien. Zeitschr.* 1830, 844. — Endlicher, *Gen.* 1309.

Dermatophyllum, Scheele, *Linnæa*, xxi. 458.

Gœbelia, Bunge, *Boissier Fl. Orient.* ii. 628.

Keyserlingia, Bunge, *Boissier Fl. Orient.* ii. 629.

Trees, shrubs, and perennial herbs, with unarmed terete branches, supra or subpetiolar buds, and fibrous roots. Leaves alternate, unequally pinnate, persistent or deciduous; stipules minute, deciduous; leaflets numerous and small or few and ample, membranaceous, or coriaceous; stipels minute, setaceous, often wanting. Flowers in simple racemes terminal or panicled from the axils of the upper leaves. Bracts and bractlets linear, minute, deciduous, or often wanting. Calyx broadly campanulate, often slightly turbinate or obconic at the base, obliquely truncate, five-toothed, the short teeth nearly equal or the two upper subconnate, often somewhat larger than the others. Disk cupuliform, glandular, adnate to the calyx-tube. Petals white, yellow, or rarely violet blue, unguiculate; standard broadly obovate or orbicular, erect or spreading, usually shorter, rarely longer than the keel-petals; wings oblong-oblique; keel-petals oblong, suberect, as long as the wings or rather longer, overlapping each other at the back, barely connate. Stamens ten, free, or nine of them slightly connate at the base, uniform; anthers attached on the back near the middle, two-celled, the cells opening longitudinally. Ovary shortly stipitate, contracted into an incurved style terminated by a minute truncate or slightly rounded stigma; ovules indefinite, suspended from the inner angle of the ovary, superposed, amphitropous, the micropyle superior. Legume moniliform, terete or slightly compressed, naked or longitudinally four-winged, fleshy, coriaceous or woody, many-seeded, each seed inclosed in a separate cell, indehiscent or two-valved and tardily dehiscent. Seed globular, oblong or flattened, estrophiolate or nearly so, albuminous or destitute of albumen; testa thick, membranaceous, or crustaceous. Cotyledons thick and fleshy; radicle very short and straight or more or less elongated and incurved or inflexed.

Sophora is scattered through the warm parts of the world with twenty-two recognized species. Of these *Sophora tomentosa*,[1] a large shrub, is widely distributed on tropical ocean shores in the two worlds, reaching those of southern Florida and western Texas. Five other species, two of which are small trees, inhabit the territory of the United States[2] and Mexico.[3] The genus is represented in the

[1] Linnæus, *Spec.* 373. — De Candolle, *Prodr.* ii. 95. — Torrey & Gray, *Fl. N. Am.* i. 389. — Miquel, *Fl. Ind. Bat.* i. pt. i. 124. — Bentham, *Martius Fl. Brasil.* xv. pt. i. 314. — Chapman, *Fl.* 113. — Grisebach, *Fl. Brit. W. Ind.* 203. — Hemsley, *Bot. Challenger Exped.* i. pt. iii. 144.

[2] Nuttall, *Gen.* i. 280. — Torrey & Gray, *l. c.* — Gray, *Ives' Rep.* 10. — Chapman, *l. c.* — Watson, *Proc. Am. Acad.* xi. 135. — Brewer & Watson, *Bot. Cal.* i. 114. — Watson & Coulter, *Gray's Man.* ed. 6, 127.

[3] Hemsley, *Bot. Biol. Am. Cent.* i. 320.

Orient,[1] in southern Asia[2] where ten species occur, in China[3] and Japan,[4] Australia,[5] New Zealand,[6] the Hawaiian Islands,[7] Chile,[8] and tropical[9] and southern Africa.[10] It once existed in Europe, where traces of *Sophora Europæa* are common in the rocks of the lower Miocene period.[11]

The genus has not many useful properties. In China a drug prepared from the roots and leaves of *Sophora tomentosa* is used in large quantities as a tonic and diuretic;[12] and a yellow dye is made from the pods of *Sophora Japonica*, while the flower-buds of this species, which form an important article of commerce, are used to dye cloth yellow and blue cloth green, and in astringent remedies.[13] The leaves have been successfully used, it is said, as a cathartic. The seeds of the Texas and Mexican *Sophora secundiflora* contain a poisonous alkaloid, *Sophoria*, which possesses strong narcotic properties, and are believed to have supplied the Indians of Texas with a means of intoxication.[14] The Hawaiian *Sophora chrysophylla*[15] produces hard, durable, and very valuable timber, and the wood of the New Zealand and Chilian *Sophora tetraptera*[16] is distinguished for its great strength, toughness, and elasticity.[17]

Many species of Sophora are valuable ornamental plants. *Sophora Japonica*,[18] which was one of the first Asiatic trees introduced into Europe, is now a familiar inhabitant of the gardens and parks of all temperate regions, and several species of the section Edwardsia, natives of New Zealand, Chile, and the Hawaiian Islands, and distinguished principally by their winged legumes, are sometimes cultivated in European gardens,[19] where the Indian *Sophora glauca*[20] and *S. heptaphylla*[21] are also occasionally seen.

[1] Bunge, *Boissier Fl. Orient.* ii. 628, 629 (Gœbelia and Keyserlingia).

[2] Wight & Arnott, *Prodr. Fl. Ind.* 179. — Thwaites, *Enum. Pl. Zeylan.* 94. — Hooker f. *Fl. Brit. Ind.* ii. 248.

[3] Franchet, *Pl. David.* i. 100. — Hemsley, *Jour. Linn. Soc.* xxiii. 201.

[4] Thunberg, *Fl. Jap.* 178. — Miquel, *Prol. Fl. Jap.* 241. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xviii. 398 (*Mél. Biol.* ix. 71). — Franchet & Savatier, *Enum. Pl. Jap.* i. 113.

[5] Bentham, *Fl. Austral.* ii. 274.

[6] Hooker f. *Fl. New Zealand*, i. 52.

[7] Hillebrand, *Fl. Haw. Is.* 108.

[8] C. Gay, *Fl. Chil.* ii. 214 (Edwardsia).

[9] Oliver, *Fl. Trop. Afr.* ii. 253.

[10] Harvey & Sonder, *Fl. Cap.* ii. 265.

[11] Saporta, *Origine Paléontologique des Arbres*, 314.

[12] Smith, *Chinese Mat. Med.* 202.— Maiden, *Useful Native Plants of Australia*, 204.

[13] Smith, *l. c.* 201.

[14] H. C. Wood, *Phil. Med. Times*, Aug. 4, 1877. — Rothrock, *Bot. Gazette*, ii. 133. — *Nat. Dispens.* ed. 2, 1333. — Havard, *Proc. U. S. Nat. Mus.* viii. 500.

[15] Seemann, *Fl. Vit.* 66. — Hillebrand, *Fl. Haw. Is.* 108.

Edwardsia chrysophylla, Salisbury, *Trans. Linn. Soc.* ix. 299, t. 26, f. 1.

[16] Aiton, *Hort Kew.* ii. 43. — *Bot. Mag.* 167. — *Nouveau Duhamel*, iii. 82, t. 20.

[17] Kirk, *Forest Fl. New Zealand*, 84, t. 50, 51, 52.

[18] Linnæus, *Mant.* 68. — *Nouveau Duhamel*, iii. 84, t. 21. — De Candolle, *Prodr.* ii. 95. — Miquel, *Prol. Fl. Jap.* 241. — Franchet & Savatier, *Enum. Pl. Jap.* i. 113. — Franchet, *Pl. David.* i. 100. — Hemsley, *Jour. Linn. Soc.* xxiii. 202.

S. Sinica, Trochereau, *Jour. Phys.* xiv. 248.

Styphnolobium Japonicum, Schott, *Wien. Zeitschr.* 1830, 844.

Sophora Japonica was sent to Europe from China by the Père d'Incarville in 1747 (Guerrapain, *Notice sur la Culture du Sophora, du Platane et de l'Aune.* — Desfontaines, *Hist. Arb.* ii. 258) and was planted by Bernard de Jussieu in the garden of the Petit Trianon several years before it reached England, where it was introduced by the nurseryman James Gordon in 1753 (Aiton, *Hort. Kew.* ii. 45). It first flowered in Europe in 1779 in the garden of the Maréchal de Noailles at Saint-Germain-en-Laye, and in the same year in that of the Petit Trianon at Versailles.

Sophora Japonica appears to be indigenous to northern, central, and western China, and is cultivated on a considerable scale in some parts of the empire for its flower-buds. It is supposed to have been introduced into Japan, where, however, Rein (*Japan nach Reisen und Studien im Auftrage der Königlich Preussischen Regierung*, ii. 297) found it scattered over the entire country, especially in the broad-leaved forests of the north.

In the United States, where *Sophora Japonica* is hardy as far north as eastern New England, and in Europe, it forms a handsome tree sometimes forty or fifty feet in height, with a dense broad head of bright green branches and dark lustrous foliage. It is valuable as an ornamental plant from the fact that its white flowers, produced in loose panicles at the end of the branches, appear in August when few trees are in blossom. A variety with pendulous branches is common in gardens (Loudon, *Arb. Brit.* ii. 564, t.).

The wood of *Sophora Japonica* is pale brown, tough, and durable, although light and coarse-grained, the layers of annual growth being marked by broad bands of open cells. When first cut it possesses cathartic properties which make it dangerous to work until thoroughly seasoned (*Nouveau Duhamel, l. c.*).

[19] *Bot. Mag.* t. 1442, 3735. — *Bot. Reg.* 738, 1798. — *Gard. Chron.* n. ser. ix. 729. — Nicholson, *Dict. Gard.* — Naudin, *Manuel de l'Acclimateur*, 502.

[20] De Candolle, *Ann. Sci. Nat.* iv. 98; *Prodr.* ii. 95. — Hooker f. *Fl. Brit. Ind.* ii. 249.

S. velutina, Lindley, *Bot. Reg.* t. 1185.

[21] Linnæus, *Spec.* 373. — De Candolle, *l. c.* 96. — Hooker f. *l. c.* 250.

Insects are not known to injure the North American species of Sophora, which are not subject to serious fungal diseases.[1]

The generic name was formed by Linnæus from *Sophera*, the Arabic name of some tree with pea-shaped flowers.[2]

[1] Species of *Uromyces* of the order of Rusts which abound on herbaceous *Leguminosæ* are sometimes found on *Sophora sericea*, Nuttall, and may be expected to occur on the allied arborescent *Sophora affinis*.

[2] *Hort. Cliff.* 156.

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Flowers in terminal racemes; legume woody; seeds destitute of albumen; leaves persistent . 1. S. SECUNDIFLORA.
Flowers in axillary racemes; legume fleshy; seeds albuminous; leaves deciduous . . . . 2. S. AFFINIS.

SOPHORA SECUNDIFLORA.

Frijolito. Coral Bean.

FLOWERS in terminal secund racemes; stamens free. Legume woody. Leaves 7 to 9-foliolate, persistent.

Sophora secundiflora, De Candolle, *Cat. Hort. Monsp.* 148; *Prodr.* ii. 96. — Don, *Gen. Syst.* ii. 110. — Hemsley, *Bot. Biol. Am. Cent.* i. 321. — Watson, *Proc. Am. Acad.* xvii. 347. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 57. — Coulter *Contrib. U. S. Nat. Herb.* ii. 72 (*Man. Pl. W. Texas*).

Broussonetia secundiflora, Ortega, *Dec.* v. 61, t. 7.

Virgilia secundiflora, Cavanilles, *Icon.* v. 1, t. 401.

Agastianis secundiflora, Rafinesque, *New Fl.* iii. 85.

Dermatophyllum speciosum, Scheele, *Linnæa*, xxi. 459.

S. speciosa, Bentham, *Bost. Soc. Nat. Hist.* vi. 178 (*Pl. Lindheim.* ii.). — Gray, *Smithsonian Contrib.* iii. 54 (*Pl. Wright.* i.). — Walpers, *Ann.* ii. 439. — Torrey, *Bot. Mex. Bound. Surv.* 58.

A small tree, twenty-five to thirty-five feet in height, with a straight slender trunk six or eight inches in diameter, separating, several feet from the ground, into a number of upright branches which form a narrow head; or more often a shrub sending up from the ground a cluster of low stems. The bark of the trunk is half an inch thick, with a dark red-brown surface which separates into long thin narrow scales. The branchlets are at first coated with fine hoary tomentum which gradually disappears, and in their second year are glabrous or nearly so and covered with pale orange-brown bark. The leaves, which appear in February and March, are at first covered, especially on the lower surface of the leaflets, with silky white hairs; at maturity they are from four to six inches in length, with stout puberulous petioles slightly enlarged at the base, and, like the broad rachises, deeply grooved on the upper side; the leaflets are elliptical-oblong, rounded, emarginate, or sometimes mucronate at the apex, and gradually contracted at the base into short and very thick petiolules; they are destitute of stipels, thick and coriaceous, dark yellow-green above and rather paler below, glabrous or sometimes slightly puberulous along the under surface of the stout midribs, and entire with thickened margins. They are conspicuously reticulate-veined, and vary from an inch to two inches and a half in length, and from half an inch to an inch and a half in breadth. The flowers, which emit a powerful and delicious fragrance not unlike that of violets, appear with the young leaves in early spring; they are an inch long and are produced in one-sided canescent racemes two or three inches in length on stout pedicels sometimes an inch long developed from the axils of subulate deciduous bracts half an inch or more in length, and furnished near the middle with two acute bractlets broad at the base and rounded on the back. The calyx is campanulate and slightly enlarged on the upper side, the three lower teeth triangular and nearly equal, the two upper rather larger and connate almost throughout. The petals are shortly unguiculate and violet-blue, the broad erect standard being marked on the inner surface near the base with a few darker spots. The ovary is coated with long silky white hairs, which as the legume enlarges develop into dense thick white tomentum which covers the ripe fruit. This varies from one to seven inches in length and is half an inch in breadth, stalked, and crowned with the thickened remnants of the style; it is indehiscent, from one to seven-seeded, and conspicuously contracted between the seeds, with hard woody walls a quarter of an inch in thickness. The seeds, each of which is inclosed in a separate cell with thin dry walls, are oblong, rounded, half an inch in length, and bright scarlet, with a small pale hilum and bony testa, the thick inner coat being conspicuously lighter colored. The seed is destitute of albumen, the thick orange-colored cotyledons filling its cavity.

Sophora secundiflora is found on the shores of Matagorda Bay in Texas to the mountain cañons of New Mexico, and to those of Nuevo Leon and of San Luis Potosí. It usually occupies the borders

of streams, often forming broad thickets or small groves in low rather moist limestone soil, and reaches its greatest size in the neighborhood of Matagorda Bay. Farther south and west, especially west of the Pecos River, it is rarely more than a shrub.

The wood of *Sophora secundiflora* is very heavy, hard, and close-grained, with numerous thin medullary rays and a compact satiny surface: it is orange-colored streaked with red. The sapwood is thick, bright yellow, and composed of ten or twelve layers of annual growth. The specific gravity of the absolutely dry wood is 0.9842, a cubic foot weighing 61.34 pounds. It is valuable as fuel.

Sophora secundiflora was first noticed in Texas by Lindheimer[1] in the neighborhood of New Braunfels and on the shores of Matagorda Bay. It appears to have been introduced into the Botanic Garden at Madrid towards the end of the last century, and the earliest description, that of Ortega, was drawn up from the cultivated plant; it was in cultivation in the Jardin des Plantes in Paris[2] in 1854, and is occasionally found in the gardens of southern Europe.

Sophora secundiflora is one of the handsomest of the small trees of the Texas forests; its lustrous persistent foliage, large and fragrant flowers, conspicuous fruit, and brilliant seeds make it a desirable garden ornament in all regions where the climate is sufficiently temperate to develop its beauties.

[1] See i. 74.

[2] *Rev. Hort.* 1854, 201, f. 11.

EXPLANATION OF THE PLATE.

PLATE CXXI. SOPHORA SECUNDIFLORA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. The petals of a flower displayed, natural size.
4. A calyx, enlarged.
5. A flower, a portion of the calyx and the petals removed, enlarged.
6. A pistil, enlarged.
7. Vertical section of an ovary, enlarged.
8. An ovule, much magnified.
9. A cluster of fruit, natural size.
10. Vertical section of a legume, natural size.
11. Vertical section of a seed, natural size.
12. An embryo, enlarged.

C.E. Faxon del. Picart fr. &

SOPHORA SECUNDIFLORA, DC.

A. Riocreux dirext. Imp. R. Taneur, Paris

SOPHORA AFFINIS.

FLOWERS in axillary racemes; stamens slightly connate at the base, the posterior one free. Legume fleshy. Leaves 13 to 19-foliolate, deciduous.

Sophora affinis, Torrey & Gray, *Fl. N. Am.* i. 390. — Leavenworth, *Am. Jour. Sci.* xlix. 130. — Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 178 (*Pl. Lindheim.* ii.). — Scheele, *Roemer Texas*, 428. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 58. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 72 (*Man. Pl. W. Texas*).

Styphnolobium affine, Walpers, *Rep.* i. 807.

A small tree, eighteen or twenty feet in height, with a trunk eight or ten inches in diameter, dividing into a number of stout spreading branches forming a handsome round head, slender terete slightly zigzag branchlets, and thick orange-colored roots. The bark of the trunk is an eighth of an inch thick, dark reddish brown, and broken into numerous oblong scales, the surface exfoliating in thin layers. The buds are depressed, minute, almost surrounded by the base of the petioles, and are covered with broad scales which are coated on the outside with dark brown and on the inside with longer pale tomentum, and which are persistent on the base of the growing shoots. The branchlets are at first orange-brown or dark green and slightly puberulous, and in their second year are bright green marked by narrow brown ridges and with large leaf-scars and occasional dark-colored lenticular spots. The leaves, which appear in March and April, are at first coated on both surfaces with hoary pubescence; they are six to nine inches long, with slender puberulous petioles and rachises slightly grooved on the upper side. The leaflets are elliptical, obtuse or retuse, slightly mucronate, and contracted at the base into short stout pubescent petiolules; they are entire with slightly wavy thickened margins, membranaceous, pale yellow-green and glabrous on the upper surface, paler and covered with scattered hairs or nearly glabrous on the lower surface, and are from an inch to an inch and a half in length and half an inch in breadth, with prominent orange-colored midribs grooved on the upper side, slender primary veins, and conspicuous reticulated veinlets. The flowers appear in early spring with the new growth in slender axillary pubescent semipendent racemes forming conspicuous panicles at the ends of the branches, and are half an inch in length or rather longer than the slender canescent pedicels produced from the axils of minute deciduous bracts. The calyx is short, campanulate, abruptly narrowed at the base, somewhat enlarged on the upper side, and slightly pubescent, especially on the margins of the short nearly triangular teeth. The petals are shortly unguiculate, and are white tinged with rose-color; the standard is nearly orbicular, slightly emarginate, reflexed, as long and twice as broad as the ovate auriculate wings and keel-petals. The ovary is conspicuously stipitate and villose. The legumes, which vary from half an inch to three inches in length, are indehiscent, black, and more or less pubescent, and are crowned with the thickened remnants of the styles; they are four to eight or by abortion one-seeded and then subglobose; the walls are fleshy, and when fully ripe rather sweet like those of the cells inclosing the seeds. The fruit is produced in great abundance, and hangs on the branches during the winter. The seeds are oval, slightly compressed, and scarcely strophiolate, with a thin crustaceous bright chestnut-brown testa. The cotyledons, which are surrounded by a thin layer of horny albumen, are bright green; the radicle is long and incurved.

Sophora affinis inhabits the region between the valley of the Arkansas River in Arkansas and that of the San Antonio in Texas, extending westward in Texas to the upper waters of the Colorado River. It is usually found on limestone hills or along the margins of streams or of ravines or depressions in the prairie, where it often forms small groves with Oaks, Elms, Redbuds, Viburnums, and Hawthorns.

The wood of *Sophora affinis* is heavy and very hard and strong although coarse-grained, the layers of annual growth being marked by several rows of large open ducts. It contains thin conspicuous medullary rays, and is light red in color, the thick sapwood composed of ten or twelve layers of annual growth, being bright clear yellow. The specific gravity of the absolutely dry wood is 0.8509, a cubic foot weighing 53.03 pounds.

Ink is sometimes made domestically of the resinous exudations from the fruit.

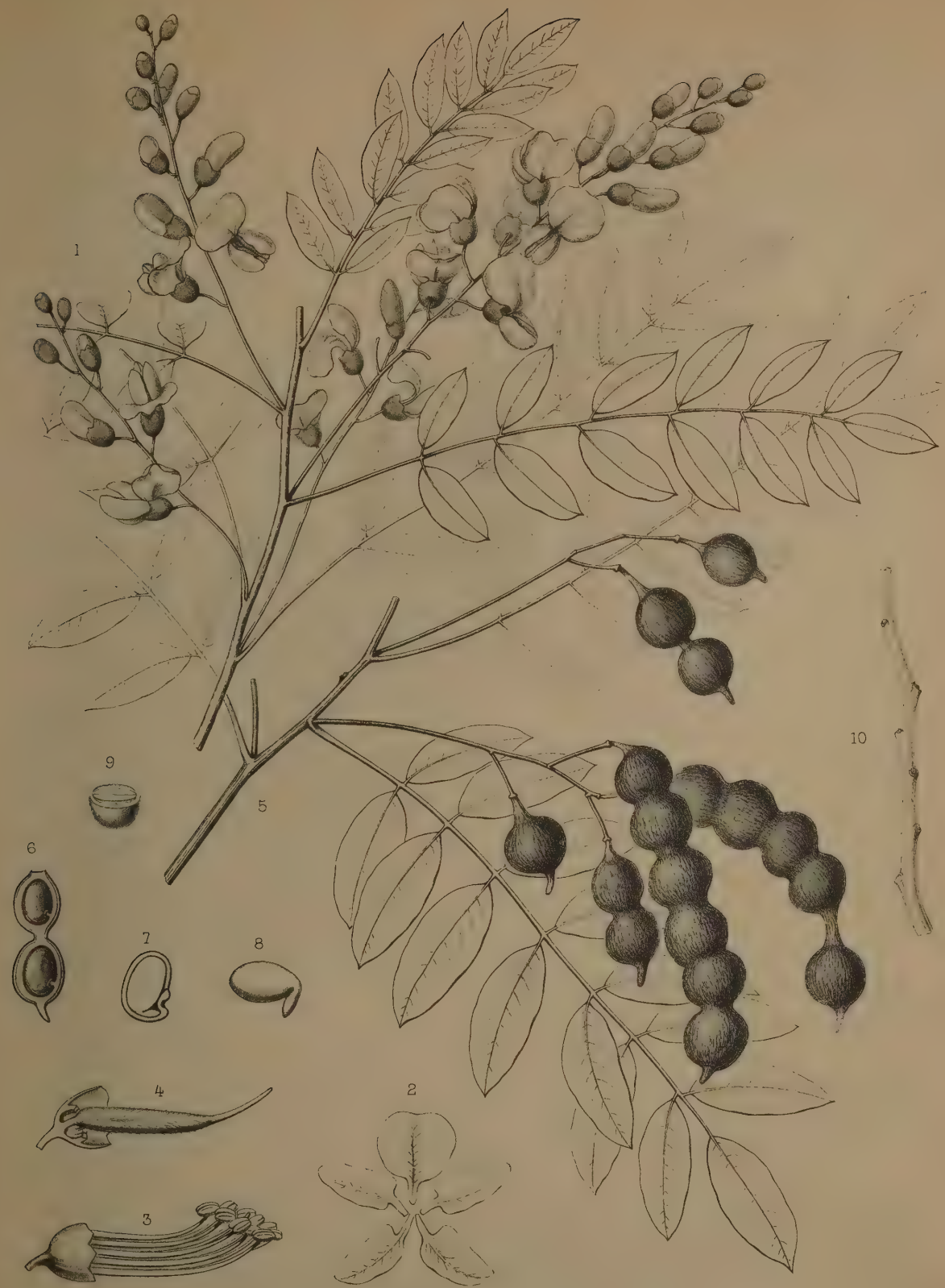
Sophora affinis was discovered in the valley of the Red River in Arkansas by Dr. M. C. Leavenworth[1] in 1821; and was introduced into cultivation through the Arnold Arboretum in 1890.

[1] Mellins C. Leavenworth was born in Connecticut early in the century. He served in the United States army as acting assistant-surgeon in 1831 and 1832, and was appointed assistant-surgeon in 1833, continuing his connection with the army until 1840. At frontier posts in Arkansas, Louisiana, and Florida, Dr. Leavenworth was able to gratify a taste for botany, for which he did useful service by observing and collecting the plants within his reach. These he communicated to Dr. Torrey with copious notes. Dr. Leavenworth was appointed assistant-surgeon of the 12th Regiment of Connecticut Volunteers, December, 1861, and died near New Orleans, November 16, 1863, while serving in the Department of the Gulf. Dr. Leavenworth was the author of a few short botanical papers printed in the *American Journal of Science and Arts*. In the earliest of these, published in 1824, four new species of plants discovered by the author in northern Alabama are described; and in others are recorded some of the results of his wide and careful observations. *Leavenworthia*, a genus of Cruciferous plants, was dedicated to him by Torrey.

EXPLANATION OF THE PLATE.

PLATE CXXII. SOPHORA AFFINIS.

1. A flowering branch, natural size.
2. The petals of a flower displayed, enlarged.
3. A flower, the corolla removed, enlarged.
4. A pistil, enlarged.
5. A fruiting branch, natural size.
6. Vertical section of a portion of a fruit, natural size.
7. Vertical section of a seed, enlarged.
8. An embryo, enlarged.
9. Cross section of a seed, enlarged.
10. A winter branchlet, natural size.



C E Faxon del. Picart fr. sc.

SOPHORA AFFINIS, Torr. et Gray.

A. Riocreux direx.t Imp. R. Taneur, Paris.

GYMNOCLADUS.

Flowers regular, dicœcious by abortion; calyx tubular, disciferous, 5-lobed, the lobes valvate in æstivation; petals 4 or 5, imbricated in æstivation; ovary sessile or slightly stipitate, 4 or many-ovuled. Legume turgid or compressed, woody, 2-valved. Leaves unequally bipinnate.

Gymnocladus, Lamarck, *Dict.* i. 733 (in part). — A. L. de Jussieu, *Gen.* 346. — Meisner, *Gen.* 98. — Endlicher, *Gen.* 1311. — Bentham & Hooker, *Gen.* i. 568. — Baillon, *Hist. Pl.* ii. 175.

Guilandina, Linnæus, *Gen.* ed. 2, 518 (in part).

Hyperanthera, Vahl, *Symb.* i. 30 (in part).

Trees, with stout unarmed blunt pithy branches, rough deeply fissured bark, and thick fleshy roots. Buds minute, depressed in pubescent cavities of the stem, two in the axil of each leaf, superposed, remote, the lower and smaller sterile and nearly surrounded by the enlarged base of the petiole; bud-scales two, ovate, rounded at the apex, coated with thick dark brown tomentum, infolded one over the other, accrescent with the young shoots. Leaves deciduous, alternate, bipinnate; pinnæ and leaflets usually alternate; stipules ample, foliaceous, early deciduous; leaflets membranaceous, ovate, entire, petiolulate. Inflorescence terminal or axillary, leafy or bracted towards the base, that of the staminate plant a short racemose corymb, of the pistillate plant an elongated raceme. Flowers greenish white, long-pedicellate, the slender pedicels developed from the axils of long lanceolate scarious caducous bracts, and furnished near the middle with two minute deciduous bractlets. Calyx tubular, elongated, ten-ribbed, lined with the thin glandular disk, five-lobed, the lobes lanceolate, acute, nearly equal, erect. Petals oblong, rounded or acute at the apex, pubescent, as long as the calyx-lobes or rather longer and twice as broad, inserted on the margin of the disk, spreading or reflexed. Stamens ten, free, inserted on the margin of the disk, erect, included; filaments filiform, pilose, those opposite the petals shorter than the others; anthers oblong, uniform, attached on the back below the middle, introrse, two-celled, the cells opening longitudinally; smaller and sterile in the pistillate flower. Ovary sessile in the bottom of the calyx-tube or slightly stipitate, acute, pilose, or glabrous, many-ovuled; style short, erect, obliquely dilated into two broad stigmatic lobes, or, in the Chinese species, contracted into a slightly oblique capitate stigma; rudimentary or wanting in the sterile flower; ovules suspended from the angle opposite the posterior petal, superposed, anatropous, the micropyle superior. Legume oblong, subfalcate, turgid, or slightly compressed, several-seeded, tardily dehiscent, two-valved, the woody valves thickened on the margins into narrow wings, pulpy between the seeds. Seed ovoid, slightly obovoid or subglobose, suspended by a long slender funicle; testa thick, bony, three-coated, brown, and opaque. Embryo surrounded by a thin layer of horny albumen; cotyledons ovate, thick and fleshy, the radicle short, erect.

Gymnocladus is now confined to the temperate parts of eastern North America and to southern China, although there is evidence that it existed in Europe during the Tertiary period.[1] Only two species are known. *Gymnocladus dioicus*, the type of the genus, inhabits America, and *Gymnocladus Chinensis*[2] several of the southern and southwestern provinces of China.

Gymnocladus is slightly astringent and purgative. The seeds of *Gymnocladus dioicus* were

[1] Saporta, *Origine Paléontologique des Arbres*, 20.

[2] Baillon, *Compt. Rend. Assoc. Franc. pour l'Avanc. Sci.* 1874, 418, t. 4; *Bull. Soc. Linn. Par.* 1875, 33; *Dict. Bot.* i. 781. — Oliver, *Hooker Icon.* xv. 9, t. 1412. — Hemsley, *Jour. Linn. Soc.* xxiii. 208; *Garden and Forest*, ii. 266. — Nicholson, *Garden and Forest*, ii. 139.

once used in some parts of the United States as a substitute for coffee; a decoction of the fresh green pulp of the unripe fruit is used in homœopathic practice,[1] and the bruised leaves are said to destroy insects feeding on them.[2] The seeds of the Asiatic species are surrounded by a detersive pulp which is used by the Chinese as a substitute for soap in washing linen and cleaning the human head.[3]

The generic name, from γυμνός and κλάδος, relates to the stout branches destitute of spray.

[1] Millspaugh, *Am. Med. Pl. in Homœopathic Remedies*, i. 53, t. 53.

[2] See Millspaugh, *l. c.*

[3] Bretschneider, *Notes on some Botanical Questions connected with the Export Trade of China*, 14. — Hanbury, *Science Papers*, 238, f. 5.

GYMNOCLADUS DIOICUS.

Kentucky Coffee Tree.

INFLORESCENCE terminal. Leaves 10 to 14-pinnate, the lowest pinnæ reduced to simple leaflets, the others 7 to 13-foliolate.

Gymnocladus dioicus, Koch, *Dendr.* i. 5. — Baillon, *Hist. Pl.* ii. 88, f. 52, 53; *Dict.* i. 781. — Sargent, *Garden and Forest*, ii. 375.

Guilandina dioica, Linnæus, *Spec.* 381. — Marshall, *Arbust. Am.* 56.

Gymnocladus Canadensis, Lamarck, *Dict.* i. 733; *Ill.* iii. 412, t. 823. — Michaux, *Fl. Bor.-Am.* ii. 241, t. 51. — Willdenow, *Spec.* iv. 816; *Enum.* 1019; *Berl. Baumz.* 169. — Persoon, *Syn.* ii. 626. — Desfontaines, *Hist. Arb.* ii. 250. — Michaux f. *Hist. Arb. Am.* ii. 272, t. 23. — Pursh, *Fl. Am. Sept.* i. 304. — Nuttall, *Gen.* ii. 243. — Hayne, *Dendr. Fl.* 203. — Reichenbach, *Mag. Bot.* t. 40. — De Candolle, *Prodr.* ii. 480. — Sprengel, *Syst.* ii. 327. — Torrey, *Fl. N. Y.* i. 191; *Emory's Rep.* 407. — Hooker, *Fl. Bor.-Am.* i. 166. — Don, *Gen. Syst.* ii. 429. — Spach, *Hist. Vég.* i. 89. — Torrey & Gray, *Fl. N. Am.* i. 398. — Walpers, *Rep.* i. 809. — Bell, *Rep. Geolog. Surv. Can.* 1879–80, 54°. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 63. — Chapman, *Fl.* ed. 2, Suppl. 618. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 58. — Watson & Coulter, *Gray's Man.* ed. 6, 148.

Hyperanthera dioica, Vahl, *Symb.* i. 31.

A tree, seventy-five to one hundred and ten feet in height, with a trunk two or three feet in diameter, usually separating, ten or fifteen feet from the ground, into three or four principal divisions which spread slightly and form a narrow pyramidal head; or occasionally sending up a tall straight shaft destitute of branches for seventy or eighty feet. The bark of the trunk is from three quarters of an inch to an inch in thickness and deeply fissured, the dark gray surface being tinged with red and roughened by small persistent scales. The branchlets when they first appear are coated with short thick pubescence faintly tinged with red, and bear at their bases until nearly grown the conspicuous orange-green pubescent bud-scales which at maturity are broadly obovate, rounded at the apex, and an inch long. At the end of the first season the branchlets are a quarter to a third of an inch thick, very blunt, and composed of a thick core of light orange-brown pith surrounded by a thin layer of bright yellow wood covered with bright green astringent inner bark and thin dark brown often slightly pilose outer bark marked by orange-colored lenticular spots and large pale broadly heart-shaped leaf-scars. The leaves are from one to three feet in length and eighteen to twenty-four inches in breadth, and are obovate in outline by the greater development of the upper pairs of pinnæ; and are covered when they unfold with hoary tomentum, except on the upper surfaces of the leaflets. The leaf-stalks and those of the pinnæ are terete, abruptly and conspicuously enlarged at the base, glabrous at maturity, and pale green or frequently purple on the upper side. The stipules are foliaceous, lanceolate, or slightly obovate, glandular-serrate towards the apex, a third of an inch in length, and deciduous. The leaflets are pink at first but soon become bronze-green, and are lustrous and glabrous on the upper surface with the exception of a few scattered hairs along the midribs;[1] when fully grown they are from two to two and a half inches in length and an inch in breadth, or those which replace the lower or occasionally the two lower pairs of pinnæ sometimes twice as large; they are membranaceous, obscurely veined, ovate, acute, or often mucronate, especially while young, wedge-shaped or irregularly rounded at the base by the greater development of the upper side, dark green above, pale yellow-green below, and glabrous with the exception of a few soft hairs scattered along the narrow midribs, the entire slightly thickened and revolute wavy margins, and the short stout petiolules. The leaves appear about the middle

[1] The trees are conspicuous at the time the leaves are expanding by the contrast of colors furnished by the leaflets. Those near the ends of the leaves are bright pink, while those on the lower pinnæ which had opened first are green or bronze-colored.

of May or after most of the deciduous trees of the American forests have covered themselves with foliage,[1] and in the autumn turn a bright clear yellow. The inflorescence of the sterile tree is three or four inches in length, the lower branches, which are somewhat swollen at the base, being usually three or four-flowered. The inflorescence of the female tree is ten or twelve inches long, the flowers being borne on stout pedicels from an inch to two and a half inches in length, or from twice to five times the length of those of the staminate flowers. The calyx is two thirds of an inch long, conspicuously ten-ribbed and clothed in the bud, like the petioles and the exterior surface of the petals, with thick white tomentum; when the flowers are expanded they are covered on the outer surface with pale hairs, and on the inner surface with thick pale tomentum. The petals are keeled, pilose on the back, slightly grooved, and clothed with tomentum on the inner surface, and are rather longer than the calyx-lobes and about twice as broad. The anthers are bright orange-colored. The ovary is sessile, covered with hairs, many-ovuled, and contracted into a short style dilated above into two broad lobes stigmatic on their inner surface. The legumes, which hang unopened on the branches throughout the winter, are subfalcate, with more or less thickened margins, six to ten inches in length, an inch and a half to two inches in breadth, and dark reddish brown covered with a slight glaucous bloom; they are borne on stout stalks an inch or two long, and are crowned with the thickened pointed remnants of the styles. Their valves are thin, tough, and woody, and contain between the seeds a thick layer of dark-colored sweet pulp. The seeds are three quarters of an inch long, ovate, or slightly obovate and compressed, with a hard bony coat and albumen, and orange-colored cotyledons.

Gymnocladus dioicus is found growing spontaneously on the shores of Cayuga and Seneca Lakes in New York[2] and on the banks of Conococheague Creek in Franklin County, Pennsylvania;[3] it extends westward through southern Ontario[4] and southern Michigan to the valley of the Minnesota River, to eastern Nebraska, eastern Kansas, and southwestern Arkansas, and to about longitude 96° west in the Indian Territory, and southward between the Alleghany Mountains and the Mississippi River to middle Tennessee. Although distributed over a wide area, *Gymnocladus dioicus* is one of the rarest of the forest trees of eastern North America. It selects bottom-lands and the richest soil, where it grows in company with the Black Walnut, the Blue Ash, the Hackberry, the Cottonwood, the Honey Locust, the Red Elm, and the Hickories.

The wood of *Gymnocladus dioicus* is heavy although not very hard, strong, coarse-grained, liable to check in drying, and very durable in contact with the ground; it can be easily worked, and the surface will take a good polish. It contains many thin medullary rays, and bands of one or two rows of open ducts marking the layers of annual growth. It is rich light brown in color, tinged with red, the thin sapwood composed of five or six layers of annual growth, being rather lighter colored than the heartwood. The specific gravity of the absolutely dry wood is 0.6934, a cubic foot weighing 43.21 pounds. It is occasionally used in cabinet-making, and for fence-posts, rails, and in construction.

Gymnocladus dioicus, mentioned by Linnæus[5] in 1742 as growing in Paris, was first described by Duhamel in the *Traité des Arbres*[6] published in 1755; according to Aiton[7] it was cultivated in England in 1748 by the Duke of Argyll.[8]

Gymnocladus dioicus is now a familiar inhabitant of the gardens and parks of the United States[9] and of northern and central Europe, and is valued for its hardiness, rapid growth, and good habit, for the singular appearance that its naked branches present in winter, for the lightness, grace, and cheerful color of its great leaves, and for its immunity from disease.

[1] The stout dark-colored branchlets destitute of spray give to Gymnocladus in winter and especially in spring the appearance of a dead tree. This appearance has caused it to be called *Chicot* (Branche morte ou couverte de chancres) by the French settlers in America, and it is by this name that it is now known in France.

[2] Dudley, *Bull. Cornell Univ.* ii. 26 (*Cayuga Fl.*).

[3] Where it was discovered by Professor T. C. Porter.

[4] Brunet, *Cat. Vég. Lig. Can.* 19. — Macoun, *Cat. Can. Pl.* 512.

[5] *Gen.* ed. 2, 518.

[6] *Bonduc Canadense polyphyllum, non spinosum mas & fœmina*, i. 108, t. 42.

[7] *Hort. Kew.* ed. 2, v. 400. — Loudon, *Arb. Brit.* ii. 656, t.

[8] See i. 108.

[9] *Garden and Forest*, ii. 75, f. 49.

The Kentucky Coffee-tree, as it is almost universally called in the United States and in England, from the use which at one time was made of the seeds, is not at all particular about the character of the soil in which it is planted, although it will not grow rapidly or to a great size except in deep rich and rather humid loam. It may be propagated by seeds which the pistillate plants produce rather sparingly, and which sometimes do not germinate until the second or third years, and more easily and quickly from cuttings made from pieces of the roots, which soon form rootlets and grow with vigor.[1]

[1] Briot, *Rev. Hort.* 1870, 436.

EXPLANATION OF THE PLATES.

Plate CXXIII. Gymnocladus dioicus.

1. An inflorescence of the staminate tree, natural size.
2. An inflorescence of the pistillate tree, natural size.
3. Diagram of a flower.
4. Vertical section of a staminate flower, enlarged.
5. Front view of a long and a short stamen, enlarged.
6. A female flower, a portion of the calyx, corolla, and stamens removed, enlarged.
7. A pistil, a vertical section of the ovary removed, enlarged.
8. An ovule, much magnified.

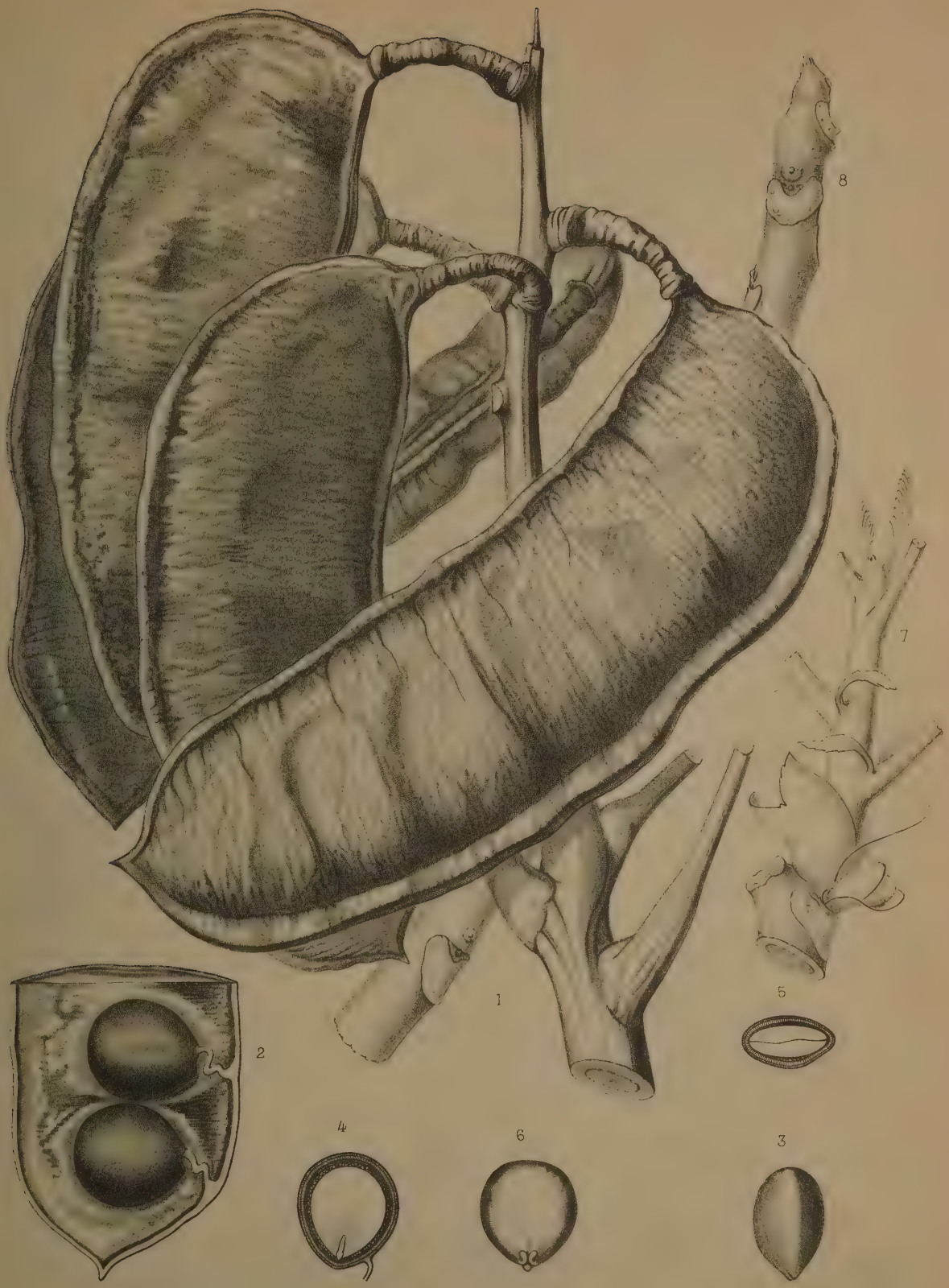
Plate CXXIV. Gymnocladus dioicus.

1. A cluster of fruit, natural size.
2. A portion of a legume, one of the valves removed, natural size.
3. A seed, natural size.
4. Vertical section of a seed, natural size.
5. Cross section of a seed, natural size.
6. An embryo, enlarged.
7. Base of a young branchlet with bud-scales and stipules, natural size.
8. A winter branchlet, natural size.

C.E.Faxon del. Picart fr. sc.

GYMNOCLADUS DIOICUS, C. Koch.

A. Riocreux direx.t Imp. R. Taneur, Paris.



C.E. Faxon del Picart fr. sc.

GYMNOCLADUS DIOICUS, C. Koch.

A. Riocreux direx.t Imp. R. Taneur Paris

GLEDITSIA.

FLOWERS regular, polygamous by abortion; calyx campanulate, disciferous, 3 to 5-lobed, the lobes valvate or slightly imbricated in æstivation; petals 3 or 5, imbricated in æstivation; ovary subsessile, 2 or many-ovuled. Legume indehiscent or tardily 2-valved. Leaves abruptly pinnate or bipinnate.

Gleditsia, Linnæus, *Gen.* ed. 2, 480. — Adanson, *Fam. Pl.* ii. 319. — Meisner, *Gen.* 100. — Endlicher, *Gen.* 1311. — Bentham & Hooker, *Gen.* i. 568. — Baillon, *Hist. Pl.* ii. 175.

Melilobus, Mitchell, *Act. Nat. Cur.* viii. Appx. 215. — Rafinesque, *Sylva Tellur.* 121.

Asacara, Rafinesque, *Neogen.* 2.

Trees, with furrowed bark, terete branchlets, minute subpetiolar buds, and thick fibrous roots, the branches and trunk often armed with stout simple or branched spines or abortive branches developed from supra-axillary or adventitious buds. Leaves deciduous, alternate, often fascicled in earlier axils, abruptly pinnate or bipinnate often on the same individual, the lower pinnæ sometimes reduced to single leaflets; stipules minute, caducous; leaflets membranaceous, their margins irregularly crenate, destitute of stipels. Flowers minute, green or white, short-pedicellate, in axillary or lateral simple or fascicled racemes. Bracts minute, scale-like, caducous. Calyx campanulate, lined with the disk, three to five-lobed, the narrow lobes only imperfectly inclosing the petals in the bud, nearly equal. Petals as many as the lobes of the calyx, nearly equal. Stamens six to ten, inserted with the petals on the margin of the disk, exserted; filaments free, filiform, erect; anthers uniform, attached on the back below the middle, introrse, two-celled, the cells opening longitudinally; much smaller and abortive in the pistillate flower. Ovary inserted in the bottom of the disk, subsessile, rarely bicarpellary, rudimentary or wanting in the staminate flower; style short; stigma terminal, more or less dilated, often declinate; ovules two or many, suspended from the angle opposite the posterior petal, superposed, anatropous, the micropyle superior. Legume many or rarely one or two-seeded, elongated, straight, compressed, pulpy between the seeds, indehiscent, the walls thin and membranaceous; or ovate, destitute of pulp, and tardily dehiscent, or slightly turgid and indehiscent with hard woody walls. Seed transverse, obovate, or compressed, attached by a long slender funicle; testa thin, crustaceous, light brown. Embryo surrounded by a layer of horny albumen; cotyledons subfoliaceous, compressed; radicle short, erect, slightly exserted.

Gleditsia is represented in the flora of eastern America by two species, one of which is the type of the genus; it occurs on the mountains of west tropical Africa,[1] in the Orient,[2] and in China and Japan;[3] and in the Tertiary period existed in Europe.[4] In China four species and possibly more, as the Chinese Gleditsias are still very imperfectly known, are found scattered from the northern to the southern provinces of the empire.[5]

Many of the parts of Gleditsia are astringent, and several of the species produce strong, durable,

[1] *Gleditsia Africana*, Bentham, *Trans. Linn. Soc.* xxv. 304.

[2] *Gleditsia Caspica*, Desfontaines, *Hist. Arb.* ii. 247. — Koch, *Dendr.* i. 10. — Boissier, *Fl. Orient.* ii. 631. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xxxi. 37 (*Mél. Biol.* xii. 451). This is a small tree generally distributed through the forest region of the province of Talysch south of the Caspian Sea, and in northern Persia, and is to be distinguished from *Gleditsia triacanthos* by its leaflets, which are twice as large as those of that species, and by its shorter pods.

[3] *Gleditsia Japonica*, Miquel, *Prol. Fl. Jap.* 242. — Franchet & Savatier, *Enum. Pl. Jap.* i. 114; ii. 327. — Maximowicz, *l. c.* A handsome tree, widely scattered through the empire, especially in the northern islands, where it grows near the borders of streams and in the forests which cover the lower slopes of the mountains, and is often cultivated in the neighborhood of villages.

[4] Saporta, *Origine Paléontologique des Arbres*, 20.

[5] Maximowicz, *l. c.* — Hemsley, *Jour. Linn. Soc.* xxiii. 208, t. 5; *Garden and Forest*, ii. 266.

although coarse-grained timber. The pulp which surrounds the seeds has a sweet taste when fresh, but becomes bitter and astringent. Beer has been made in the United States by fermenting the fresh pods of *Gleditsia triacanthos*,[1] and in Japan the pods of *Gleditsia Japonica* were formerly employed as soap, and once formed an article of some commercial importance.[2]

The American species are not seriously injured by insects,[3] and are subject to few fungal diseases.[4]

The generic name commemorates the scientific labors of Johann Gottlieb Gleditsch,[5] a contemporary and friend of Linnæus, and professor of botany at Berlin.

[1] Porcher, *Resources of Southern Fields and Forests*, 195.

[2] Rein, *Japan nach Reisen und Studien im Auftrage der Königlich Preussischen Regierung*, ii. 298.

[3] The Honey Locusts are less injured by insects than Robinia, although a borer, *Eburia quadrigeminata*, Say, is said to live in their trunks. Web-worms and some other general leaf-eating insects occur on them, and the leaves are sometimes mined by the larvæ of small moths. The larvæ of *Pempelia gleditschiella*, Fernald, are described as drawing the leaves together and feeding on them (*Rep. Dept. Agric.* 1880, 262). In some parts of the country they are injured by the maggots of *Cecidomyia gleditschiæ*, Osten Sacken, which distort the young leaflets and prevent their development (*Proc. Entomol. Soc. Phil.* vi. 219).

[4] The leaves of Gleditsia are sometimes injured in the United States by *Leptostroma hypophyllum*, Berk. & Rav., which appears in the form of small black spots, and by the mildew *Microsphæria Ravenelii*, Berk., which produces velvety olive-colored patches on the leaves. Of the fungi which attack the stems the most important are *Botryosphæria Gleditschiæ*, Sacc., *Sphæropsis Gleditschiæ*, Cooke, and *Sphæropsis mamillaris*, B. & C., but they are not known to cause serious injury.

[5] Johann Gottlieb Gleditsch (1714–1786), a native of Leipsic, was appointed in 1771 to the chair of botany in the University of Berlin, which he occupied during the remainder of his life. He wrote numerous botanical treatises and one of the earliest works on scientific forestry, his chief merit as an author being the application of botanical methods to rural science.

CONSPECTUS OF THE NORTH AMERICAN SPECIES.

Legume linear-oblong, elongated, many-seeded, pulpy, indehiscent; leaflets lanceolate-oblong .	1. G. TRIACANTHOS.
Legume oval, oblique, one or two-seeded, without pulp, tardily dehiscent; leaflets ovate, oblique	2. G. AQUATICA.

GLEDITSIA TRIACANTHOS.

Honey Locust. Three Thorned Acacia.

LEGUME linear-oblong, elongated, many-seeded, pulpy, indehiscent. Leaflets lanceolate-oblong.

Gleditsia triacanthos, Linnæus, *Spec.* 1056. — Miller, *Dict.* ed. 8, No. 1. — Du Roi, *Harbk. Baum.* i. 294. — Medicus, *Bot. Beob.* 1782, 230. — Wangenheim, *Nordam. Holz.* 81. — Castiglioni, *Viag. negli Stati Uniti*, ii. 249. — Lamarck, *Dict.* ii. 465; *Ill.* iii. 446, t. 857, f. 1. — Moench, *Meth.* 69. — Abbot, *Insects of Georgia*, ii. t. 85. — Michaux, *Fl. Bor.-Am.* ii. 257. — Schkuhr, *Handb.* iv. 346, t. 356. — Persoon, *Syn.* ii. 623. — Desfontaines, *Hist. Arb.* ii. 246. — Willdenow, *Spec.* iv. 1097; *Enum.* 1058; *Berl. Baumz.* 163. — *Nouveau Duhamel*, iv. 100, t. 25. — Michaux f. *Hist. Arb. Am.* iii. 164, t. 10. — Pursh, *Fl. Am. Sept.* i. 221. — Nuttall, *Gen.* ii. 239. — James, *Long's Exped.* i. 138. — Hayne, *Dendr. Fl.* 218. — Elliott, *Sk.* ii. 709. — Guimpel, Otto & Hayne, *Abbild. Holz.* 157, t. 132. — De Candolle, *Prodr.* ii. 479. — Watson, *Dendr. Brit.* ii. 138, t. 138. — Sprengel, *Syst.* iii. 918. — Torrey, *Fl. N. Y.* i. 192. — Audubon, *Birds*, t. 42, 146, 150. — Jaume St. Hilaire, *Traité des Arbres*, t. 31. — Roemer & Schultes, *Syst.* vii. 73. — Don, *Gen. Syst.* ii. 428. — Spach, *Hist. Vég.* i. 92. — Torrey & Gray, *Fl. N. Am.* i. 398. — Dietrich, *Syn.* v. 539. — Chapman, *Fl.* 115. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 49. — Koch, *Dendr.* i. 8. — Brunet, *Cat. Vég. Lig. Can.* 20. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 59. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xxxi. 37 (*Mél. Biol.* xii. 451). — Watson & Coulter, *Gray's Man.* ed. 6, 149. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 95 (*Man. Pl. W. Texas*).

G. spinosa, Marshall, *Arbust. Am.* 54.

G. Meliloba, Walter, *Fl. Car.* 254.

G. ferox, Desfontaines, *Hist. Arb.* ii. 247. — Sprengel, *Syst.* iii. 919. — Don, *Gen. Syst.* ii. 428. — Spach, *Hist. Vég.* i. 94. — Dietrich, *Syn.* v. 539.

G. elegans, Salisbury, *Prodr.* 323.

G. heterophylla, Rafinesque, *Fl. Ludovic.* 99.

Melilobus heterophylla, Rafinesque, *Sylva Tellur.* 121.

A tree, seventy-five to one hundred and forty feet in height, with a trunk two or three or occasionally five or six feet in diameter, and slender spreading somewhat pendulous branches which form a broad and often rather flat top. The bark of the trunk is from half to three quarters of an inch thick and is separated by deep fissures into long narrow longitudinal ridges, the surface of which is roughened by small persistent scales. The buds are minute, three or four together, and superposed, the two or three lower being without scales and covered by the embossed scar left by the falling of the petiole, while the upper one is larger, nearly surrounded by the petiole and covered with minute scurfy scales;[1] the spine-bud is minute, at some distance above the axil of the leaf, and embedded in the bark. The branchlets, which at first are light reddish brown, and slightly puberulous, are somewhat zigzag by the enlargement of the swollen nodes, and are thickened at the apex; they consist of a thin core of light yellow pith surrounded by a thick layer of pale straw-colored wood covered with lustrous reddish bark tinged with green and marked with minute lenticular spots; in their second year they are grayish brown. The spines, which are undeveloped branches, are three or four inches long, simple or three-forked,[2] terete, very sharp and rigid, long-pointed, thickened at the base, red at first and bright chestnut-brown when fully grown; they are produced on some individuals from above the axils of all the leaves, and sometimes in large numbers on the trunk and main branches, but are wanting or nearly wanting on others.[3] The leaves are from seven to eight inches in length, long-petiolate with petioles

[1] Macaire, *Bibl. de Gen.* xvii. 142. — Gray, *Structural Botany*, 56, f. 96.

[2] Baillon, *Bull. Soc. Bot. France*, v. 316.

[3] *G. triacanthos*, var. *inermis*, Willdenow, *Berl. Baumz.* 163. — Pursh, *Fl. Am. Sept.* i. 221. — De Candolle, *Mém. Légum.* t. 22, f. 109; *Prodr.* ii. 479. — Don, *Gen. Syst.* ii. 428. — Torrey & Gray, *Fl. N. Am.* i. 398. — Loudon, *Arb. Brit.* ii. 650, t. 92, 93. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 59. *G. inermis*, Moench, *Meth.* 69.

Individuals which have grown under conditions where they have been fully exposed to the light most frequently develop spines, while those which have grown in the forest in the shade of other trees are often unarmed — a rule, however, which does not always hold good.

abruptly enlarged at the base, and, like the rachises, flattened and grooved on the upper side; they are eighteen to twenty-eight-foliolate or sometimes bipinnate, with four to seven pairs of pinnæ, which increase in length towards the apex of the leaf, the upper pair being four or five inches long and the lowest often single leaflets; when they unfold they are covered with thick white tomentum; at maturity they are pubescent on the petioles and rachises, on the short stout petiolules, and on the under surface of the midribs of the leaflets. In autumn they turn a pale clear yellow. The leaflets are lanceolate-oblong, rather unequal at the base by the greater development of the upper side, acute or slightly rounded at the apex, remotely crenulate-serrate, dark green and lustrous on the upper surface, dull yellow-green on the lower surface, and from one to one and a half inches long and half an inch broad. The flowers are produced in June, when the leaves are nearly fully grown, from the axils of those of the year or of previous years, the staminate in short many-flowered pubescent racemes, which lengthen after the flowers begin to open, and which at maturity are from two to two and a half inches in length and often clustered, the pistillate in slender graceful few-flowered and usually solitary racemes two and a half to three and a half inches long. The flower-buds are nearly globose, and are covered with hoary orange-colored pubescence persistent on the outer surface of the calyx after the flowers have opened. The calyx is campanulate, narrowed at the base, its acute lobes, which have thick revolute ciliate margins and thickened tips and are covered on the two surfaces with white hairs, being rather shorter than the erect acute petals and half their width. The stamens are exserted, with slender filaments pilose towards the base and green anthers. The pistil is occasionally bicarpellary and is coated with thick white tomentum. The legumes, which are twelve to eighteen inches long or sometimes much shorter,[1] dark brown, pilose and slightly falcate with straight thickened margins, are borne two or three together in short racemes on stalks an inch or an inch and a half in length; their walls are thin and tough, with a thin papery inner coat, and contain a quantity of pulp between the seeds; they contract in drying with a number of cork-screw twists, and fall late in the autumn or in early winter.[2] The seeds are oval, flattened, and a third of an inch in length, with thin albumen and orange-colored embryos.

Gleditsia triacanthos grows naturally on the western slope of the Alleghany Mountains in Pennsylvania, and ranges westward through southern Ontario[3] and Michigan to eastern Nebraska and Kansas, and to about longitude 96° west in the Indian Territory, and southward to northern Alabama and Mississippi, and to the valley of the Brazos River in Texas. East of the Alleghany Mountains it has often become naturalized by seeds scattered from cultivated trees. It inhabits the borders of streams and intervale lands, growing in the most fertile soils with the Black Walnut, the Shellbark Hickory, the Red Elm, the Blue Ash, the Box Elder, and the Kentucky Coffee-tree, usually singly, but sometimes so multiplied as to form the prevailing tree-growth over considerable areas; or less commonly it is found on dry and sterile gravelly hills like those of central Kentucky to which the name of "barrens" has been given, and upon which it is the characteristic and often the prevailing tree. In the valleys of the smaller streams of southern Indiana and Illinois *Gleditsia triacanthos* attains its greatest size and majesty. Here individuals may still be found from one hundred and twenty to one hundred and forty feet in height, with trunks six feet in diameter and free of branches for sixty or seventy feet.[4] In less favorable situations and in poorer soil it is low, stunted, wide-branched, and often covered with thorns.

[1] *Gleditsia brachycarpa*, Pursh, *Fl. Am. Sept.* i. 221. — De Candolle, *Prodr.* ii. 479. — Sprengel, *Syst.* iii. 919. — Don, *Gen. Syst.* ii. 428. — Loudon, *Arb. Brit.* ii. 653. — Dietrich, *Syn.* v. 539.

G. triacanthos, var. *brachycarpos*, Michaux, *Fl. Bor.-Am.* ii. 257. — Torrey & Gray, *Fl. N. Am.* i. 399. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 59.

[2] The contraction of the walls of the pods of *Gleditsia triacanthos* seems to be intended to facilitate the distribution of the seeds. Without this provision they would remain where they fall under the trees, but the pods thus twisted roll like wheels, and, being very light, are blown for great distances over the frozen ground and especially over the snow. The obstacles they are obliged to overcome in their journeys probably help to break open the pods and liberate the seeds.

[3] J. W. Burgess, *Bot. Gazette*, vii. 95.

[4] Ridgway, *Proc. U. S. Nat. Mus.* 1882, 64.

The wood of *Gleditsia triacanthos* is hard, strong, and very durable in contact with the ground, although it is coarse-grained, with broad bands of large open ducts marking the layers of annual growth, and many conspicuous medullary rays. It is red or bright red-brown, with thin pale sapwood composed of ten or twelve layers of annual growth. The specific gravity of the absolutely dry wood is 0.6740, a cubic foot weighing 42.00 pounds. It is largely used for fence-posts and rails, and for the hubs of wheels, and somewhat in construction, for which purpose its weight and strength give it value.

Gleditsia triacanthos was first cultivated in Europe by Bishop Compton[1] in his garden at Fulham near London towards the end of the seventeenth century,[2] and the first account of it, drawn from the cultivated tree, was published by Plukenet[3] in 1700.

The Honey Locust[4] has been extensively planted both in the United States and in Europe since its first introduction.[5] It has many qualities to recommend it as an ornamental tree for the decoration of parks or the borders of highways. It is easily raised from seed and grows rapidly; it is not particular about soil; it is extremely hardy, and remarkably free from serious disease and the attacks of disfiguring insects. It can support the drought and dirt of cities better than most trees, and when well grown few trees compare with it in the beauty of its massive dark trunk and spreading head and in the grace and lightness of its lustrous foliage.[6] The lateness of the Honey Locust in covering itself with leaves, which do not appear until most trees are in full leaf, is the only serious drawback to it as an ornamental tree. Its hardiness, robust growth, and stout well-armed branches make it an excellent hedge plant, and it has been largely used for this purpose.

Few varieties of the Honey Locust have appeared in cultivation, and none of them possess special value with the exception of the form known in gardens as *Gleditsia Bujotii*,[7] distinguished by its graceful pendulous branches and small leaflets.

[1] See i. 6.

[2] Aiton, *Hort. Kew.* iii. 444.

[3] *Acacia Americana Abruæ foliis triacanthos, sive ad axillas foliorum spinâ triplici donata, Alm. Bot. Mant.* 1; *Amalth. Bot.* t. 352, f. 1. — Boerhaave, *Hort. Lugd. Bat.* ii. 56. — Miller, *Dict.* No. 1.

Acacia triacanthos, siliquis latis fuscis, pulpa virescente subdulci, Clayton, *Fl. Virgin.* 59.

Cæsalpinoides foliis pinnatis ac duplicato-pinnatis, Linnæus, *Hort. Cliff.* 489.

Gleditsia, Clayton, *Fl. Virgin.* 193. — Linnæus, *Hort. Ups.* 298. — Gouan, *Hort. Monsp.* 520.

[4] *Gleditsia triacanthos* is also called in some parts of the country Black Locust, Sweet Locust, and Honey Shucks.

[5] Duhamel, *Traité des Arbres*, i. 265, t. 105. — Evelyn, *Silva*, ed. Hunter, ii. 61. — Cobbett, *Woodlands*, No. 394. — Loudon, *Arb. Brit.* ii. 650, t. 91.

[6] The pistillate trees are more desirable than the staminate for ornamental plantings, as the fruit which hangs in great profusion from all the branches is conspicuous and beautiful from midsummer until it falls. The only sure way of obtaining them is by grafting seedling plants with grafts taken from trees known to bear female flowers.

[7] This handsome and distinct plant appeared previous to 1845 among a number of seedlings raised by a Monsieur Bujot, a nurseryman at Château-Thierry (*Rev. Hort.* 1845, 205).

EXPLANATION OF THE PLATES.

PLATE CXXV. GLEDITSIA TRIACANTHOS.

1. A flowering branch of the staminate plant, natural size.
2. A flowering branch of the pistillate plant, natural size.
3. Diagram of a flower.
4. A staminate flower, enlarged.
5. Vertical section of a staminate flower, enlarged.
6. A pistillate flower, enlarged.
7. Vertical section of a pistillate flower, enlarged.
8. Vertical section of an ovary, enlarged.
9. An ovule, much magnified.

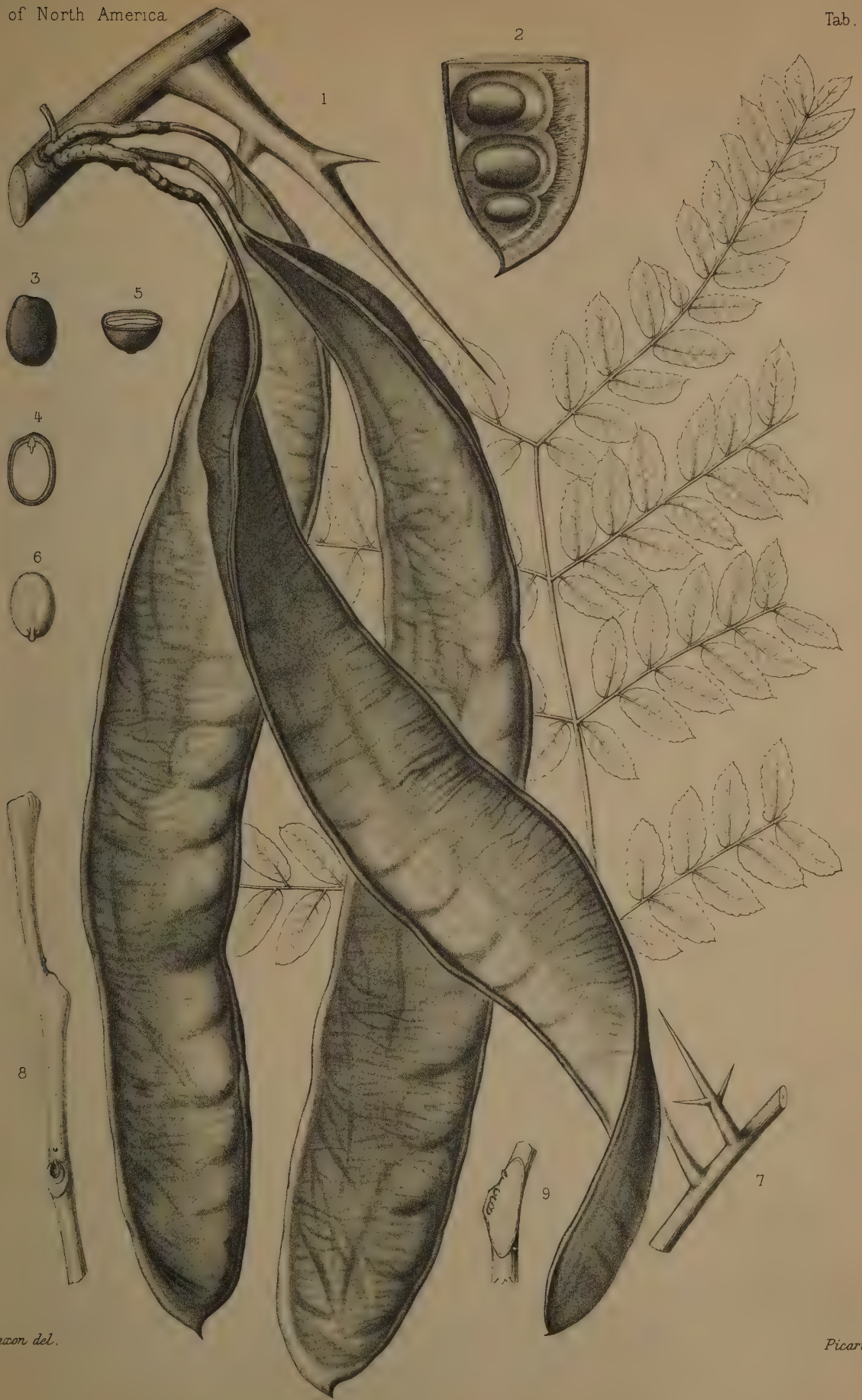
PLATE CXXVI. GLEDITSIA TRIACANTHOS.

1. A cluster of fruit and a spine, natural size.
2. Vertical section of a portion of a legume, natural size.
3. A seed, natural size.
4. Vertical section of a seed, natural size.
5. Cross section of a seed, natural size.
6. An embryo, slightly enlarged.
7. A doubly pinnate leaf, natural size.
8. A winter branchlet, natural size.
9. Vertical section of a part of a branch showing the position of the buds.

C.E. Faxon del. Picart fr. sc.

GLEDITSIA TRIACANTHOS, L.

A Riocreux direx.t Imp. R. Taneur, Paris.



C.E. Faxon del. Picart fr. sc.

GLEDITSIA TRIACANTHOS, L.

A. Riocreux direx.t Imp. R. Taneur, Paris.

GLEDITSIA AQUATICA.

Water Locust.

LEGUME oval, oblique, usually one-seeded, without pulp, tardily dehiscent. Leaflets ovate-oblong.

Gleditsia aquatica, Marshall, *Arbust. Am.* 54. — E. L. Greene, *Bull. Torrey Bot. Club*, xiv. 225. — Watson & Coulter, *Gray's Man.* ed. 6, 149.

G. triacanthos, β. Linnæus, *Spec.* 1057.

G. inermis, Miller, *Dict.* ed. 8, No. 2 (not Linnæus). — Du Roi, *Harbk. Baum.* i. 296. — Koch, *Dendr.* i. 9. — E. L. Greene, *Bull. Torrey Bot. Club*, xv. 110. — Sargent, *Garden and Forest*, ii. 376.

G. monosperma, Walter, *Fl. Car.* 254. — Michaux, *Fl. Bor.-Am.* ii. 257. — Schkuhr, *Handb.* iv. 347. — Persoon, *Syn.* ii. 623 — Desfontaines, *Hist. Arb.* ii. 246. — Willdenow, *Spec.* iv. 1097; *Enum.* 1058; *Berl. Baumz.* 165. — *Nouveau Duhamel*, iv. 101. — Michaux f. *Hist. Arb. Am.* iii. 169, t. 11. — Pursh, *Fl. Am. Sept.* i. 221. — Nuttall, *Gen.* ii. 239. — Hayne, *Dendr. Fl.* 218. — Elliott, *Sk.* ii. 709. — De Candolle, *Prodr.* ii. 479. — Sprengel, *Syst.* iii. 919. — Don, *Gen. Syst.* ii. 428. — Spach, *Hist. Vég.* i. 98. — Torrey & Gray, *Fl. N. Am.* i. 398. — Dietrich, *Syn.* v. 539. —Chapman, *Fl.* 115. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 64. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 59. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xxxi. 40 (*Mél. Biol.* xii. 455).

G. triacanthos, β. **aquatica**, Castiglioni, *Viag. negli Stati Uniti*, ii. 249.

G. Carolinensis, Lamarck, *Dict.* ii. 465; *Ill.* iii. 447, t. 857, f. 2. — Roemer & Schultes, *Syst.* vii. 74.

G. triacantha, Gærtner, *Fruct.* ii. 311, t. 146, f. 3.

Asacara aquatica, Rafinesque, *Sylva Tellur.* 121.

A tree, fifty to sixty feet in height, with a short trunk from two to two and a half feet in diameter, usually dividing, a few feet from the ground, into stout spreading and often contorted branches which form a wide irregular flat-topped head. The bark of the trunk is rarely more than an eighth of an inch thick, and is smooth, dull gray, or reddish brown, and divided by shallow fissures into small plate-like scales. The branchlets are glabrous and orange-brown, and in their second year are gray or reddish brown and marked by occasional large pale lenticels. The spines are usually compressed, simple or with one or two short lateral branches, straight or falcate, very sharp and rigid, three to five inches long, half an inch broad at the base, and dark red-brown and lustrous. The leaves are long-petiolate and from twelve to eighteen-foliolate, or are doubly pinnate with three or four pairs of pinnæ which increase in length towards the apex of the leaf. The petioles are slightly enlarged at the base, and, like the rachises, are slender, terete, and glabrous. The leaflets are ovate-oblong, usually rounded or rarely emarginate at the apex, unequally wedge-shaped at the base, slightly and remotely crenate, or often entire below the middle, dark green and lustrous on the upper surface, and dull yellow-green on the lower. They are glabrous with the exception of a few hairs on the short stout petiolules, and are an inch long and from a third to half an inch broad. The flowers are produced in May and June, after the leaves are fully grown, in slender racemes three or four inches long, with dark purple somewhat puberulous peduncles. The pedicels are short and stout, occasionally geminate, purple, and puberulous. The flower-buds are ovate or obovate, pointed at the apex, and covered with orange-brown pubescence which remains on the outer surface of the calyx-tube after the flowers have expanded. The calyx-lobes are narrow, acute, a little pilose on the two surfaces, and as long but narrower than the green erect petals which are rounded at their apex. The stamens are slightly exserted, with slender filaments hairy towards the base and large green anthers. The ovary is long-stipitate and glabrous. The legumes, which hang in graceful racemes, are pulpless, an inch to two inches long, an inch broad, obliquely ovate, long-stalked, and crowned with short stout tips. They are thin, with thin tough papery bright chestnut-brown lustrous valves somewhat thickened on the margins, and contain one, or rarely two, flat slightly obovate seeds half an inch in length with a thin orange-brown testa, thick albumen, and

compressed orange-colored embryos. The legumes, which are fully grown in August, and which are often produced in great quantities, fall in the autumn.

Gleditsia aquatica is found in the coast region of the southern Atlantic states from South Carolina to Matanzas Inlet in Florida, and in the Gulf states from the shores of Tampa Bay to the valley of the Brazos River in Texas; it spreads northward through western Louisiana and southern Arkansas to middle Kentucky and Tennessee, and to southern Illinois and Indiana. The Water Locust is rare east of the Mississippi River, where it grows in deep river-swamps with the Cypress, the Cotton Gum, the Scarlet Maple, and the Swamp Oak, but abounds on the rich bottom-lands west of the Mississippi, where it attains its greatest size and often occupies extensive tracts of low rich ground submerged during a considerable part of the year.

The wood of *Gleditsia aquatica* is heavy, and very hard and strong, although rather coarse-grained, with a fine surface which takes a high polish. It contains thin, conspicuous medullary rays, and bands composed of one to three rows of open ducts marking the layers of annual growth. It is rich bright brown tinged with red, the thick sapwood composed of about forty layers of annual growth, being a light clear yellow. The specific gravity of the absolutely dry wood is 0.7342, a cubic foot weighing 45.76 pounds.

The Water Locust was discovered in South Carolina by Mark Catesby, who introduced it into English gardens,[1] and who published the first description and figure of it in 1731 in his *Natural History of Carolina.*[2]

The Water Locust has not proved hardy in New England, and is now very rarely cultivated even in the more temperate parts of Europe.

[1] Loudon, *Arb. Brit.* ii. 653, f. 364.

[2] *Acacia Abruæ foliis, triacanthos, capsula ovali unicum semen claudente*, i. 43, t. 43.

Acacia Americana palustris abruæ foliis spinis rarioribus, Miller, *Dict.* No. 2.

Cæsalpinoides foliis pinnatis ac duplicato-pinnnatis, a. Linnæus, *Hort. Cliff.* 489.

EXPLANATION OF THE PLATES.

Plate CXXVII. Gleditsia aquatica.

1. A flowering branch of the staminate plant, natural size.
2. A flowering branch of the pistillate plant, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A stamen, enlarged.
6. A pistillate flower, enlarged.
7. Vertical section of a pistillate flower, enlarged.
8. Vertical section of an ovary, enlarged.

Plate CXXVIII. Gleditsia aquatica.

1. A fruiting branch, natural size.
2. A legume, natural size.
3. A legume, one of the valves removed, natural size.
4. Vertical section of a seed, natural size.
5. Cross section of a seed, natural size.
6. An embryo, natural size.
7. A portion of a branch with a doubly pinnate leaf, natural size.

C.E.Faxon del. *Picart fr. sc.*

GLEDITSIA AQUATICA, Marsh.

A.Riocreux direx.t *Imp. R.Tancur, Paris.*

C.E. Faxon del. Picart fr. sc.

GLEDITSIA AQUATICA, Marsh

A. Riocreux dirext Imp. R. Taneur, Paris.

CERCIDIUM.

FLOWERS perfect, in short axillary racemes; calyx disciferous, 5-lobed, the lobes valvate in æstivation; petals 5, nearly equal, imbricated in æstivation; ovary many-ovuled. Legume linear-oblong, compressed, 2-valved, conspicuously nerved on the ventral suture. Leaves abruptly bipinnate.

Cercidium, Tulasne, *Arch. Mus. Paris*, iv. 133. — Bentham & Hooker, *Gen.* i. 570. — Baillon, *Hist. Pl.* ii. 172.

Rhetinophlœum, Karsten, *Fl. Columb.* ii. 25.

Trees or shrubs, with stout tortuous branches covered with bright green bark and armed with slender straight axillary spines. Leaves alternate, abruptly bipinnate, early deciduous, petiolate; pinnæ two or occasionally three, four to eight-foliolate; stipules inconspicuous or wanting; leaflets ovate or obovate, without stipels. Flowers in short graceful few-flowered axillary racemes solitary or fascicled. Bracts minute, membranaceous, early deciduous. Calyx contracted into a long stipe jointed on the slender pedicel, membranaceous, shortly campanulate, persistent, with equal acute deciduous lobes reflexed at maturity, their margins scarious, slightly revolute. Petals orbicular or oblong, unguiculate, bright yellow, the upper one broader and longer clawed than the others, a little auricled at the base of the blade, the claw (in the North American species) conspicuously glandular at the base. Stamens ten, inserted with the petals on the margin of the disk, free, slightly declinate, exserted; filaments filiform, pilose below, the upper one (in the North American species) enlarged at the base and gibbous on the upper side; anthers uniform, ovate, attached on the back below the middle, versatile, two-celled, the cells opening longitudinally. Ovary short-stalked, inserted at the base of the calyx-tube, glabrous or covered with long hairs; style slender, involute, infolded in the bud and terminated by a minute stigma; ovules suspended from the angle of the ovary opposite the posterior petal, superposed, anatropous, the micropyle superior. Legume linear-oblong, compressed or somewhat turgid, straight or slightly contracted between the seeds, thickened on the margins, that of the ventral suture acute or slightly grooved, tipped with the remnants of the style, tardily dehiscent, two-valved, the valves membranaceous or subcoriaceous, obliquely veined. Seeds suspended longitudinally on long slender funicles, ovate, compressed, the minute hilum near the apex; testa thin, crustaceous. Embryo compressed, surrounded by a thin layer of horny albumen; cotyledons oval, flat, rather fleshy; radicle very short, erect, near the hilum.

Cercidium is confined to the warmer parts of the New World, where it is distributed with four or five species[1] from the southern borders of the United States through Mexico, Central America, and Venezuela to Mendoza. Three species occur in the territory of the United States, two being small trees, and the third, a native of western Texas, a low intricately branched and often prostrate shrub.[2]

The North American species produce rather hard wood which is sometimes used as fuel, but the genus is not known to be otherwise useful to man.

The generic name, from *κερκίδιον*, refers to the fancied resemblance of the legume to a weaver's instrument of that name.

[1] Walpers, *Rep.* v. 552; *Ann.* iv. 594. — Karsten, *Fl. Columb.* iv. 25, t. 113 (Rhetinophlœum). — Hemsley, *Bot. Biol. Am. Cent.* i. 326.

[2] *Cercidium Texanum*, Gray, *Smithsonian Contrib.* iii. 58; v. 50 (*Pl. Wright.* i., ii.). — Walpers, *Ann. l. c.* — Torrey, *Bot. Mex. Bound. Surv.* 59. *Parkinsonia Texana*, Watson, *Proc. Am. Acad.* xi. 136. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 94 (*Man. Pl. W. Texas*).

The flowers of *Cercidium Texanum* are readily distinguished from those of the other North American species by the long white hairs which clothe the ovary.

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Legume compressed, with straight margins; leaflets green, slightly glandular . . . . . 1. C. FLORIDUM.

Legume somewhat turgid, the margins often slightly contracted between the seeds; leaflets glaucous . . . . . 2. C. TORREYANUM.

CERCIDIUM FLORIDUM.

Green Barked Acacia.

LEGUME compressed, with straight acute margins. Leaflets green, slightly glandular.

Cercidium floridum, Bentham; Gray, *Smithsonian Contrib.* i. 58 (*Pl. Wright.* i.). — Walpers, *Ann.* iv. 594. — Hemsley, *Bot. Biol. Am. Cent.* i. 327. — Sargent, *Garden and Forest*, ii. 388.

Parkinsonia florida, Watson, *Proc. Am. Acad.* xi. 135. — Brewer & Watson, *Bot. Cal.* i. 162. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 94 (*Man. Pl. W. Texas*).

A tree, eighteen to twenty feet in height, with a short crooked trunk eight or ten inches in diameter and stout spreading branches covered with thin smooth bright green bark, and forming a low wide head. The bark of the trunk is a sixteenth of an inch thick, light brown tinged with green, with numerous short horizontal light gray ridge-like excrescences on its otherwise smooth surface. The branches are light or dark olive-green, slightly puberulous at first but soon glabrous; they are marked by a few black lenticular dots and are armed with slender spines an inch or less in length. The leaves appear in Texas in April, and farther south probably a month earlier, and remain on the branches until October; they are an inch or an inch and a half long, with two or rarely three pinnæ, broad pubescent petioles and rachises, and oval or somewhat obovate dark green puberulous and minutely glandular leaflets about a sixteenth of an inch in length, which are borne on short stout pubescent petiolules, rounded or slightly emarginate at the apex, and when they unfold are covered on the lower surface with scattered white hairs. The flowers, which are three quarters of an inch across when expanded, open in April with the leaves, and are produced in successive crops during three or four months, flowers and fully grown fruit appearing sometimes together on the same tree; they are borne in four or five-flowered racemes, with slender stems and branches furnished with small acuminate membranaceous caducous bracts. The flower-buds are oval or obovate, rounded at the apex, of a tawny orange color, and, like the young pedicels, faintly pilose. The legumes are compressed, oblong, straight, or slightly falcate, acute, with a narrow and acutely margined ventral suture; they are tardily dehiscent, with papery valves which are yellow tinged with brown on the outer surface and bright orange-colored within. They are from two to two and a half inches long, half an inch broad, two or three-seeded, and, like the ovary, quite glabrous. The seeds are a third of an inch long and compressed, with thin albumen covering the sides only of the bright green embryos.

Cercidium floridum is distributed from the shores of Matagorda Bay to Hidalgo County in western Texas[1] and to northern Mexico, where it abounds on dry gravelly mesas from the mouth of the Rio Grande to the foothills of the Sierra Madre, and in many of the low valleys in the neighborhood of Monterey. It is not common in Texas, where it appears to have been first noticed in 1881 by Mr. S. B. Buckley, but in Mexico it forms a conspicuous feature in the region which it inhabits, enlivening it with its bright green branches, and in spring and early summer with its abundant brilliant golden flowers.

The wood of *Cercidium floridum* is light, soft, and close-grained, with a smooth satiny surface, and contains numerous thin prominent medullary rays, and bands of from one to three rows of open cells which mark the layers of annual growth. It is pale yellow tinged with green, the thick sapwood

[1] Where it was collected by G. C. Nealley in 1889. (See Coulter, *Contrib. U. S. Nat. Herb.* ii. 94 [*Man. Pl. W. Texas*], under *Parkinsonia Torreyana*.)

being lighter colored than the heartwood. The specific gravity of the absolutely dry wood is 0.5483, a cubic foot weighing 34.17 pounds.[1]

Cercidium floridum was probably discovered in Mexico by Dr. Thomas Coulter.[2]

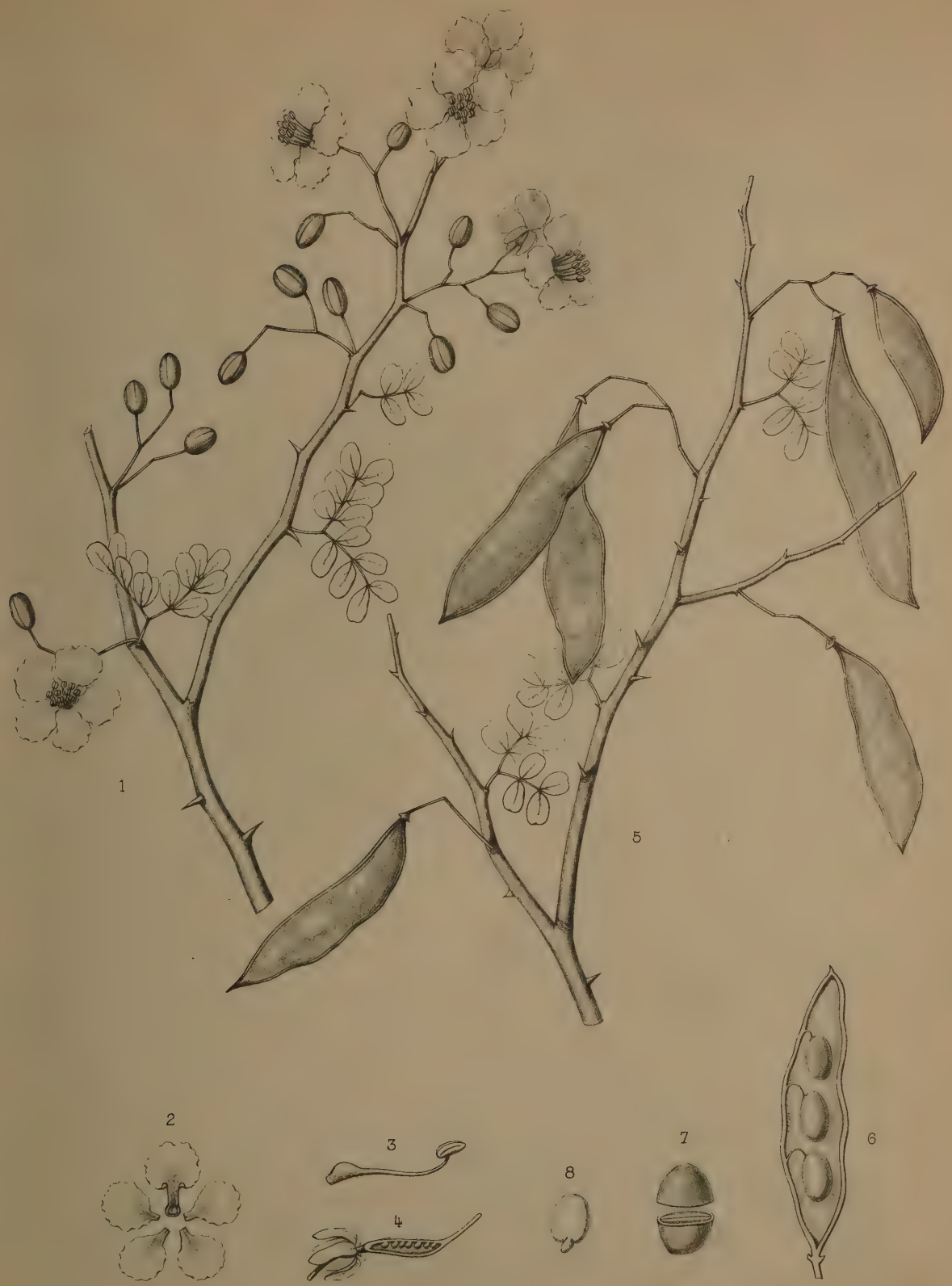
[1] *Garden and Forest*, iii. 332.

[2] Of the birth and early history of Thomas Coulter, who died in Dublin in 1843, nothing now appears to be known. He is said to have come to America as the surgeon of an English mining company; later, to gratify his taste for botanical exploration, he went to Monterey, California, which he reached in 1831, remaining there at least two years. He made a number of botanical journeys in California, and was the first botanist to explore the flora of the desert of the lower Colorado and Gila basins, which he visited in 1832. Returning to Europe, Dr. Coulter was appointed curator of the herbarium in the Botanic Garden at Dublin, a position which he filled during the remainder of his life. His name is associated in the minds of the lovers of trees with a noble California Pine discovered by him and remarkable for the great size of its cones.

EXPLANATION OF THE PLATE.

Plate CXXIX. Cercidium floridum.

1. A flowering branch, natural size.
2. The petals of a flower displayed, natural size.
3. A stamen, enlarged.
4. Vertical section of a pistil, enlarged.
5. A fruiting branch, natural size.
6. A legume, one of the valves removed, natural size.
7. A seed cut transversely, enlarged.
8. An embryo, enlarged.



C.E. Faxon del. Picart fr. sc.

CERCIDIUM FLORIDUM. Benth.

A. Riocreux direx.t Imp. R. Taneur, Paris.

CERCIDIUM TORREYANUM.

Green Barked Acacia. Palo Verde.

LEGUME somewhat turgid, often slightly contracted between the seeds, the nerve of the ventral suture often slightly grooved. Leaflets glaucous.

Cercidium Torreyanum, Sargent, *Garden and Forest*, ii. 388.

Cercidium floridum, Torrey, *Pacific R. R. Rep.* iv. 82; v. 360, t. 3; *Bot. Mex. Bound. Surv.* 59 (not Bentham). — Gray, *Ives' Rep.* 11.

Parkinsonia Torreyana, Watson, *Proc. Am. Acad.* xi. 135. — Brewer & Watson, *Bot. Cal.* i. 162. — Hemsley, *Bot. Biol. Am. Cent.* i. 327.

A low, intricately branched tree, leafless for most of the year, twenty-five to thirty feet in height, with a short often inclining trunk eighteen or twenty inches in diameter, and stout branches covered with yellow or olive-green bark, forming a narrow upright irregular head. The bark of the trunk on old trees is reddish brown, an eighth of an inch thick, and furrowed near the base, the surface separating into thick plate-like scales; on young individuals it is thinner, smooth, and pale olive-green. The branchlets are slightly zigzag, quite glabrous even when they first appear, light yellow or pale olive-green and glaucous, and are armed with thin straight or curved spines a quarter of an inch long. The leaves are an inch in length, covered when they unfold with pale tomentum, and puberulous at maturity, with slender petioles and two pinnæ, each composed of two or three pairs of oblong obtuse glaucous leaflets narrowed towards the somewhat oblique base, and from a twelfth to a sixth of an inch long. The leaves, which are few and scattered, unfold in March and April, and fall almost as soon as they are fully grown, a small second crop sometimes appearing in September after the autumn rains. The flowers, which open in April, are hardly distinguishable from those of *Cercidium floridum*. The legumes are three or four inches long, two to eight-seeded, slightly turgid, and often contracted between the seeds, the nerve of the ventral suture being often grooved; they ripen and fall from the trees during the month of July. The seeds are thicker, but otherwise resemble those of *Cercidium floridum*.

Cercidium Torreyanum grows on the Colorado Desert of southern California and in the valley of the lower Gila River in Arizona, extending southward into Sonora and Lower California.[1] It is scattered on the sides of low cañons and in depressions among the sand-hills of the desert, which it brightens with the cheerful coloring of its trunk and branches, exciting the delight and wonder of all travelers in that dreary and forbidding region.

The wood of *Cercidium Torreyanum* is heavy although not strong, soft and close-grained, with a satiny surface susceptible of receiving a good polish. It contains numerous thin medullary rays, and small evenly distributed open ducts. It is light brown with clear light yellow sapwood. The specific gravity of the absolutely dry wood is 0.6531, a cubic foot weighing 40.70 pounds.

The Green-barked Acacia was probably discovered in southern California by Frémont during his second transcontinental journey.

[1] Vasey & Rose, *Contrib. U. S. Nat. Herb.* No. 3, 69, 88.

EXPLANATION OF THE PLATE.

Plate CXXX. Cercidium Torreyanum.

1. A flowering branch, natural size.
2. A young leafy shoot, natural size.
3. Diagram of a flower.
4. The petals of a flower displayed, enlarged.
5. A flower, the calyx and corolla removed, enlarged.
6. A pistil, enlarged.
7. An ovule, much magnified.
8. A fruiting branch, natural size.
9. A legume, one of the valves removed, natural size.
10. Vertical section of a seed, natural size.
11. Cross section of a seed, natural size.
12. An embryo, enlarged.

C.E. Faxon del. Picart fr. sc.

CERCIDIUM TORREYANUM, Sarg

A. Riocreux direx.t Imp. R. Taneur, Paris.

PARKINSONIA.

FLOWERS perfect, in axillary racemes; calyx disciferous, 5-lobed, the lobes slightly imbricated or subvalvate in æstivation; petals 5, nearly equal, narrowly imbricated or valvate in æstivation; ovary many-ovuled. Leaves abruptly bipinnate.

Parkinsonia, Linnæus, *Gen.* 342. — Adanson, *Fam. Pl.* ii. 318. — A. L. de Jussieu, *Gen.* 347. — Meisner, *Gen.* 98. — Endlicher, *Gen.* 1314. — Bentham & Hooker, *Gen.* i. 570. — Baillon, *Hist. Pl.* ii. 171.

Trees or shrubs, with smooth thin bark and terete branches often armed with simple or three-forked spines. Leaves alternate or fascicled from earlier axils, short-petiolate, the rachis short and spinescent with two to four secondary elongated rachises bearing numerous minute opposite entire leaflets without stipels; stipules short, spinescent, persistent, or caducous. Flowers on thin elongated jointed pedicels developed from the axils of minute caducous bracts, in slender axillary solitary or fascicled racemes. Calyx shortly campanulate, the narrow membranaceous lobes nearly equal, reflexed at maturity, deciduous. Petals bright yellow, unguiculate, much longer than the lobes of the calyx, spreading, the upper one rather broader than the others and glandular at the base of the claw. Stamens ten, inserted in two rows on the margin of the disk, free, slightly declinate, included or exserted, those of the outer row opposite the sepals and rather longer than the others; filaments villose below the middle, the upper one enlarged at the base and gibbous on the upper side; anthers uniform, attached on the back below the middle, versatile, two-celled, the cells opening longitudinally. Ovary inserted at the base of the calyx-tube, shortly stipitate, pilose, many-ovuled, contracted into a slender filiform incurved style infolded in the bud and tipped with a minute stigma; ovules suspended from the inner angle of the ovary, two-ranked, anatropous, the micropyle superior. Legume linear, torulose, acuminate at the two ends, two-valved, the valves thin and coriaceous, convex by the growth of the seeds, contracted between and beyond them, and longitudinally striate, the endocarp readily separable from the exocarp at maturity. Seed oblong, suspended longitudinally by a slender funicle, the hilum minute, near the apex; testa thin, crustaceous, light brown. Embryo inclosed on the sides only by thick layers of horny albumen; cotyledons oval, flat, slightly fleshy, the radicle very short and straight.

The genus Parkinsonia, which contains three species, is confined to the warmer parts of America and to southern Africa, where a single species[1] occurs. The American species are small trees found within the territory of the United States, one in the mountains of Arizona, and the other, *Parkinsonia aculeata*, the type of the genus, along our southern border, where it sometimes has the appearance of having grown without the agency of man.[2]

The American species furnish hard close-grained wood. *Parkinsonia aculeata* has long been used in many tropical countries to form hedges, its stout well-armed branches, rapid growth, and indifference to heat and drought making it valuable for this purpose. In some parts of India the branches are cut as food for goats,[3] and it is said to have supplied the natives of Mexico with a febrifuge and

[1] *Parkinsonia Africana*, Sonder, *Linnæa*, xxiii. 38. — Harvey & Sonder, *Fl. Cap.* ii. 269.

[2] *Parkinsonia aculeata* has become widely naturalized through the warmer and tropical parts of the world, and its native country is uncertain (A. de Candolle, *Géographie Botanique*, ii. 770). According to Browne (*Nat. Hist. Jam.* 222) it was introduced into Jamaica from the mainland, and students of botanical geography believe that it has only appeared in Asia and Africa in comparatively recent years. If it is American, it is probably indigenous in the basin of the Rio Grande and on the Mexican plateau, or in some high country of western South America, as it is scarcely possible that if it had originated in the warm climate of southern Mexico or of Central America it would have been able to establish itself and spread as widely as it has in a region of such severe cold and serious climatic changes as western Texas.

[3] Brandis, *Forest Fl. Brit. Ind.* 158.

sudorific, a remedy against epilepsy,[1] and a means for producing abortion.[2] The young branches of *Parkinsonia microphylla* are greedily eaten by domestic animals, and are gathered in considerable quantities for fodder[3] by the inhabitants of the islands of the Gulf of California.

The genus, established by Plumier[4] and adopted by Linnæus, was dedicated to John Parkinson.[5]

[1] Torrey, *Bot. Mex. Bound. Surv.* 59.
[2] Havard, *Proc. U. S. Nat. Mus.* viii. 501.
[3] Vasey & Rose, *Contrib. U. S. Nat. Herb.* No. 3, 82.
[4] *Nov. Pl. Am. Gen.* 25, t. 3.
[5] See *ante*, 16.

CONSPECTUS OF THE NORTH AMERICAN SPECIES.

Flowers in long slender racemes; petals imbricated in æstivation; legumes one to eight-seeded; leaves long, the rachises of the pinnæ flat, wing-margined, many-foliolate; branches armed with the enlarged spinescent rachises of the primary leaves	1. P. ACULEATA.
Flowers in short racemes; petals valvate in æstivation; legumes one to three-seeded; leaves short, rachises of their pinnæ terete, eight to twelve-foliolate; branches unarmed	2. P. MICROPHYLLA.

PARKINSONIA ACULEATA.

Retama. Horse Bean.

FLOWERS in long slender racemes. Legumes 1 to 8-seeded. Leaves long, the rachises of the pinnæ flat, wing-margined, many-foliolate. Branches armed.

Parkinsonia aculeata, Linnæus, *Spec.* 375. — Miller, *Dict.* ed. 8, No. 1. — Lamarck, *Ill.* ii. 475, t. 336. — Persoon, *Syn.* i. 459. — Willdenow, *Spec.* ii. 513. — De Candolle, *Mém. Légum.* 119, t. 22, f. 112; *Prodr.* ii. 486. — Sprengel, *Syst.* ii. 345. — Don, *Gen. Syst.* ii. 434. — Spach, *Hist. Vég.* i. 108. — Dietrich, *Syn.* ii. 1496. — Bentham, *Bot. Voy. Sulphur*, 87. — Torrey, *Bot. Mex. Bound. Surv.* 59. — Brewer & Watson, *Bot. Cal.* i. 162. — Hemsley, *Bot. Biol. Am. Cent.* i. 327. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 60. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 94 (*Man. Pl. W. Texas*).

A low tree, eighteen to thirty feet in height, with a trunk sometimes a foot in diameter, usually separating at six or eight feet from the ground into slender spreading slightly pendulous branches which form a wide graceful head. The bark of the trunk is brown tinged with red, and an eighth of an inch thick, the generally smooth surface being broken into small persistent plate-like scales. The branchlets, which are slightly zigzag, are covered with yellow-green puberulous bark during their first season, and are glabrous, gray, or light orange-colored, and often roughened with lenticels in their second and third years. The leaves are short-petiolate, persistent, light green, and glabrous except for a few hairs on the lower part of the young secondary rachises. The spinescent rachises of the leaves produced on the young branchlets bear two or four pinnæ, and develop into stout rigid persistent sharp-pointed chestnut-brown spines an inch or occasionally an inch and a half in length and marked near the base by the prominent scars left by the falling of the pinnæ. The stipules of the primary leaves are persistent, and appear on the spines as stout lateral spiny branches. In the axils of these enlarged rachises fascicles of leaves are produced, each with a short terete spinescent rachis bearing two pinnæ and furnished with minute caducous spinescent stipules. The rachises of the pinnæ of the primary and secondary leaves are flat, a sixteenth of an inch long, conspicuously wing-margined and acute at the apex, and bear from twenty-five to thirty pairs of leaflets which vary from a sixteenth to an eighth of an inch in length and are oval or obovate, minutely apiculate, and long or short-petiolulate. The flower-buds are oval or obovate, dark orange-brown, a quarter of an inch long and shorter than the slender pedicels. The flowers are fragrant, an inch across when expanded, and produced in slender erect racemes which are five or six inches long and continue to appear on the growing branches during the spring and summer months, or in the tropics throughout the year. The petals are bright yellow, the upper one being marked near the base on the inner surface with conspicuous red spots, and are much longer than the stamens. The legumes hang in graceful racemes; they are from two to four inches in length, long-pointed, dark orange-brown, faintly pilose, and compressed between the remote seeds. These are a third of an inch long and nearly circular in section, with thick albumen and bright yellow embryos.

Parkinsonia aculeata is generally distributed in Texas along the valley of the lower Rio Grande, where it selects open situations and low wet soil on the borders and around the ends of lagoons; it is common in northern Mexico, in the valley of the Colorado River in Arizona and California, and in Lower California.

It is now well established on Key West, and is widely naturalized in the Bahama and other West

India Islands,[1] in many of the countries of Central and South America,[2] and in tropical Africa[3] and Asia.[4]

The wood of *Parkinsonia aculeata* is heavy, hard, and very close-grained, and contains numerous thin conspicuous medullary rays and small evenly distributed open ducts; it is light brown with very thick lighter colored sapwood tinged with yellow. The specific gravity of the absolutely dry wood is 0.6116, a cubic foot weighing 38.11 pounds.

Parkinsonia aculeata was first described by Plumier in the *Nova Plantarum Americanarum Genera*,[5] published in 1703; it was cultivated in the Physic Garden at Chelsea in England by Philip Miller in 1739,[6] and has quickly spread through many warm countries, where it is valued for its hardiness and rapid growth, for the strange appearance of its long fine narrow leaves and the beauty of its perennial flowers, and for its usefulness as a hedge plant. The Retama, which is the name given to *Parkinsonia aculeata* by the inhabitants of the regions bordering the Rio Grande, is often found in the gardens of southern Europe[7] and in those of western Texas; and it may now be seen growing spontaneously in the neighborhood of many of the towns of Texas, northern Mexico, and southern California.

[1] Jacquin, *Stirp. Am.* 121, t. 80; *Pl. Rar. Amer.* 61, t. 119. — *Icon. Am. Gëwach.* ii. 31, t. 135. — Lunan, *Hort. Jam.* i. 398. — Descourtilz, *Fl. Med. Antil.* i. 54, t. 12. — Macfadyen, *Fl. Jam.* 334. — Richard, *Fl. Cub.* ii. 221. — Grisebach, *Fl. Brit. W. Ind.* 204; *Pl. Lorenz.* 81. — Eggers, *Bull. U. S. Nat. Mus.* No. 13, 46.

[2] Bentham, *Martius Fl. Brasil.* xv. pt. ii. 78, t. 26.

[3] Oliver, *Fl. Trop. Afr.* ii. 267.

[4] Roxburgh, *Hort. Beng.* 31. — Wight & Arnott, *Prodr. Fl. Ind.* 284. — Miquel, *Fl. Ind. Bat.* i. pt. i. 115. — Beddome, *Fl. Sylv. S. Ind.* ii. xci. t. 13, f. 2. — Hooker f. *Fl. Brit. Ind.* ii. 260. — Gamble, *Man. Indian Timbers*, 134.

[5] *Parkinsonia aculeata, foliis minutis, uni costæ adnexis*, 25, t. 3.

Parkinsonia aculeata, foliis Mimosæ uni costæ adfixis, Gleditsch, *Hort. Walth.* 36, t. 13.

Parkinsonia, Linnæus, *Hort. Cliff.* 157, t. 13; *Hort. Ups.* 99. — Royen, *Fl. Leyd. Prodr.* 465.

Parkinsonia aculeata, foliolis minutissimis pinnatis, pennâ longiori compressa; the *Jerusalem* Thorn, Browne, *Nat. Hist. Jam.* 222.

[6] Aiton, *Hort. Kew.* ii. 49.

[7] Naudin, *Manuel de l'Acclimateur*, 392.

EXPLANATION OF THE PLATE.

PLATE CXXXI. PARKINSONIA ACULEATA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. The petals of a flower displayed, natural size.
4. Vertical section of a flower, the corolla removed, enlarged.
5. An ovule, much magnified.
6. A cluster of fruit, natural size.
7. A portion of a legume, one of the valves removed, natural size.
8. Cross section of a seed, natural size.
9. Vertical section of a seed, enlarged.
10. An embryo, enlarged.

C. E Faxon del.

Picart fr. sc.

PARKINSONIA ACULEATA, L.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

PARKINSONIA MICROPHYLLA.

FLOWERS in short racemes. Legumes 1 to 3-seeded. Leaves short, the rachises of the pinnæ terete, 8 to 12-foliolate. Branches unarmed.

Parkinsonia microphylla, Torrey, *Pacific R. R. Rep.* iv. 82; *Bot. Mex. Bound. Surv.* 59. — Walpers, *Ann.* vii. 812. — Gray, *Ives' Rep.* 11. — Bentham, *Martius Fl. Brasil.* xv. pt. ii. 78. — Watson, *Proc. Am. Acad.* xi. 136. — Brewer & Watson, *Bot. Cal.* i. 162. — Hemsley, *Bot. Biol. Am. Cent.* i. 327. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 60.

A low intricately branched tree, occasionally twenty or twenty-five feet in height, with a trunk a foot in diameter, and straight rigid branchlets terminating in stout spines; or more often a shrub with many stems from three to ten feet high. The bark on old trees is a quarter of an inch thick, dark orange-colored, and generally smooth, although sometimes roughened by scattered clusters of short light gray horizontal ridges. The branchlets are stout, pale yellow-green, covered at first with deciduous tomentum, slightly puberulous during their first and second seasons, and often marked by the persistent scales of undeveloped buds. The leaves are an inch long, pale, densely tomentose when they unfold, pubescent at maturity, and deciduous at the end of a few weeks after their appearance; the rachis is short, rarely spinescent, or more commonly wanting; the rachises of the pinnæ are slightly grooved on the upper side and are jointed at the points of attachment of the leaflets which are distant, entire, sessile, broadly oblong or nearly orbicular, obtuse or somewhat acute at the apex, oblique at the base, and a sixth of an inch long. The flowers, which are a third of an inch across when expanded, are borne on slender pedicels in racemes an inch or less in length developed from the axils of leaves of the previous year; they are pale yellow, with exserted stamens, and open in May or early June before the new growth and the leaves appear. The legumes, which probably hang on the branches for at least a year, are frequently one, and rarely three-seeded; they are two or three inches long, slightly puberulous, especially towards the base, and are contracted at the two ends, the long acuminate apex being often falcate. The seed is a third of an inch in length, with a pale brown testa and a bright green embryo.

Parkinsonia microphylla inhabits the deserts of southern Arizona and the adjacent regions of California, Sonora, and Lower California.

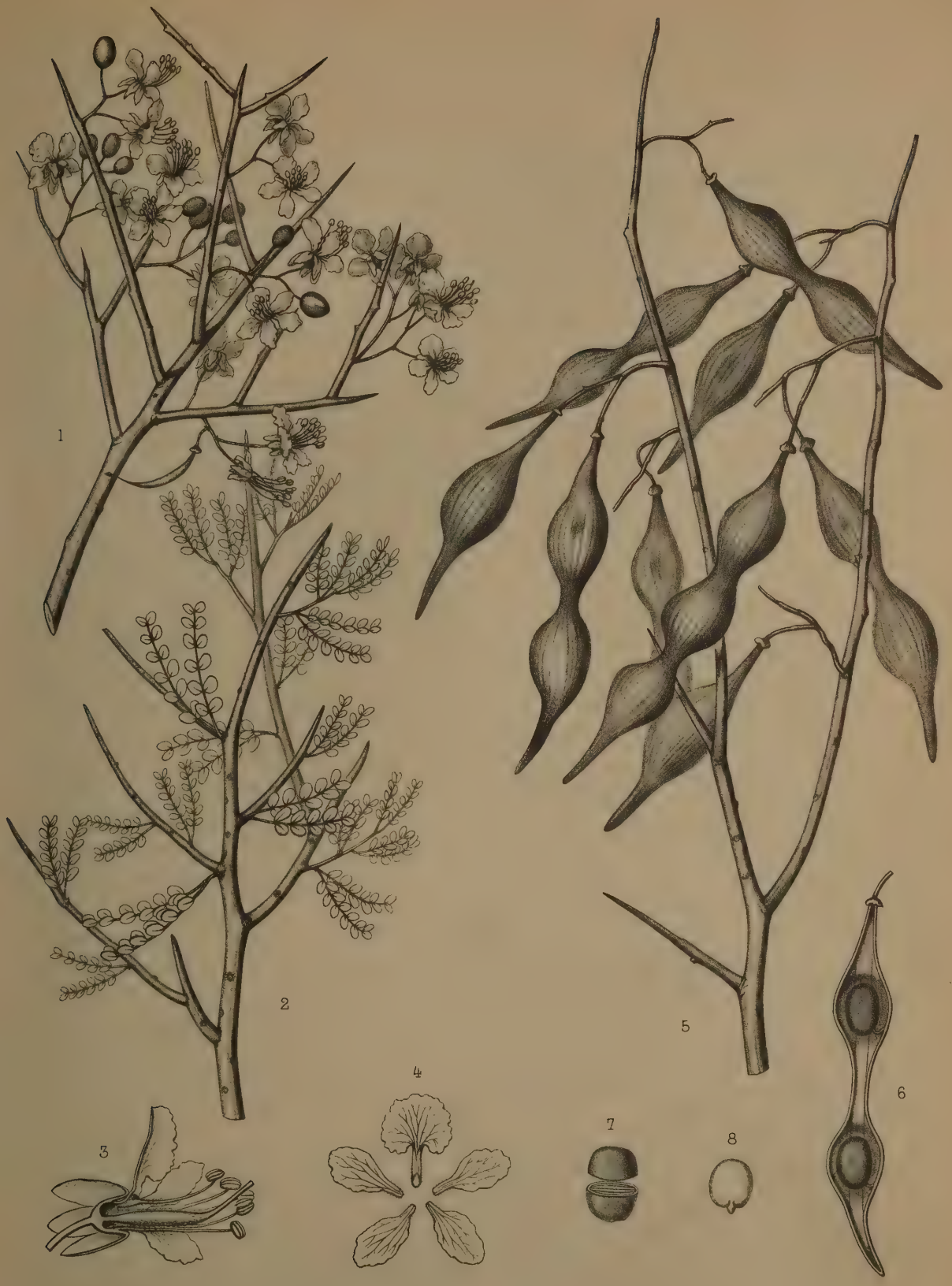
The wood is heavy, hard, and close-grained, with numerous thin conspicuous medullary rays and many large scattered open ducts. It is dark orange-brown streaked with red, with thick light brown or yellow sapwood composed of twenty-five or thirty layers of annual growth. The specific gravity of the absolutely dry wood is 0.7449, a cubic foot weighing 46.42 pounds.

Parkinsonia microphylla is nowhere common, and it is only known to attain the size and habit of a tree in the neighborhood of Wickenburg in Arizona. It appears to have been first discovered, probably in the valley of the Colorado River, by Dr. Thomas Coulter in 1832, although it was not described until many years later, when it was rediscovered by the members of the Mexican Boundary Survey Commission.

EXPLANATION OF THE PLATE.

PLATE CXXXII. PARKINSONIA MICROPHYLLA.

1. A flowering branch, natural size.
2. A leafy branch, natural size.
3. Vertical section of a flower, enlarged.
4. The petals of a flower displayed, enlarged.
5. A fruiting branch, natural size.
6. A legume, one of the valves removed, natural size.
7. A seed cut transversely, enlarged.
8. An embryo, slightly enlarged.



C. E. Faxon del.

Picart fr. sc.

PARKINSONIA MICROPHYLLA, Torr.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

CERCIS.

FLOWERS fascicled or racemose; calyx disciferous, shortly turbinate, 5-toothed, the short broad teeth imbricated in æstivation; corolla subpapilionaceous, the upper petal the smallest, inserted within the others; ovary many-ovuled. Legume compressed, narrow-winged on the ventral suture. Leaves simple.

Cercis, Linnæus, *Gen.* 125. — A. L. de Jussieu, *Gen.* 351. — Meisner, *Gen.* 99. — Endlicher, *Gen.* 1310. — Bentham & Hooker, *Gen.* i. 576. — Baillon, *Hist. Pl.* ii. 187. Siliquastrum, Adanson, *Fam. Pl.* ii. 317.

Small trees or shrubs, with scaly bark, slender unarmed branches, and small scaly buds. Leaves simple, alternate, entire or emarginate at the apex, three or many-nerved, long-petiolate, deciduous; stipules small, membranaceous, deciduous. Flowers on thin jointed pedicels in simple fascicles or in short or long racemes produced on the branches of the previous or of earlier years, or on the trunk.[1] Bracts small, scale-like, often imbricated at the base of the inflorescence; bractlets minute or wanting. Calyx colored, persistent, the tube oblique at the base, campanulate, enlarged on the lower side, the five teeth short and broadly triangular. Petals nearly equal, pink or rose-color, oblong-ovate, rounded at the apex, unguiculate, slightly auricled on one side of the base of the blade, the upper one the smallest and inclosed in the bud by the wings encircled by the broader slightly imbricated keel-petals, the vexillum and wings reflexed after anthesis. Stamens ten, inserted in two rows on the margin of the thin disk, free, declinate, those of the inner row opposite the petals and rather shorter than the others; filaments enlarged and pilose below the middle, persistent until the fruit is grown; anthers uniform, oblong, attached on the back near their base, two-celled, the contiguous cells opening longitudinally. Ovary shortly stipitate, inserted obliquely in the bottom of the calyx-tube, many-ovuled; style filiform, fleshy, incurved, tipped with a stout obtuse stigma; ovules two-ranked, superposed, attached to the inner angle of the ovary, anatropous, the micropyle superior. Legume slightly stipitate, oblong or broadly linear, acute at the two ends, compressed, tipped with the thickened remnants of the style, many-seeded, two-valved, the valves coriaceo-membranaceous, reticulate-veined, tardily dehiscent by the dorsal and often by the wing-margined ventral suture, dark red-purple and rather lustrous at maturity, the thin endocarp silvery white. Seed suspended transversely by a slender funicle, ovate or oblong, compressed, the hilum near the apex, small, depressed; testa crustaceous, reddish brown, the tegmen thickened. Embryo surrounded by a thin layer of horny albumen, compressed; cotyledons oval, flat, the radicle short, straight or obliquely incurved, slightly exserted.

Cercis is found in North America, where it occurs on the two sides of the continent, in Europe, in the Orient, and in central and eastern Asia. The type is an ancient one, and the genus has existed in Europe almost in its present state from the Eocene period.[2] Seven species are now distinguished. The type of the genus, *Cercis Siliquastrum*,[3] is widely distributed in southern Europe and in the Orient.[4] *Cercis Griffithii*[5] inhabits Afghanistan, *Cercis Chinensis*[6] and *Cercis racemosa*[7] the prov-

[1] The flowers developed upon the trunk or the old branches are, according to Baillon (*Hist. Pl.* ii. 122), produced year after year from excrescences which correspond to the axils of ancient leaves, and are composed of the remnants of the axes of earlier inflorescences which have gradually united and formed a more or less prominent mass.

[2] Saporta, *Origine Paléontologique des Arbres*, 315, f. 43, 2, 3.

[3] Linnæus, *Spec.* 374. — Sibthorp, *Fl. Græc.* iv. 60, t. 367. — De Candolle, *Prodr.* ii. 518. — *Bot. Mag.* t. 1138. — Loudon, *Arb. Brit.* ii. 657. — Koch, *Dendr.* i. 13.

[4] Boissier, *Fl. Orient.* ii. 633.

[5] Boissier, *l. c.*

[6] Bunge, *Mém. Sav. Etr. St. Pétersbourg*, ii. 95 (*Enum. Pl. Chin. Bor.* 21). — Miquel, *Prol. Fl. Jap.* 243. — Franchet & Savatier, *Enum. Pl. Jap.* i. 116. — Hemsley, *Jour. Linn. Soc.* xxiii. 213.

[7] Oliver, *Hooker Icon.* xix. t. 1894. — Hemsley, *l. c.*

inces of central and northern China; *Cercis Chinensis* is also found in Japan, where it is thought to have been introduced. Of the North American species two are small trees, and the third, *C. occidentalis*,[1] an inhabitant of the western foothills of the California Sierras, is a tall many-branched shrub.[2]

Cercis, bestowed on the European species by Linnæus, who discarded the *Siliquastrum* of Tournefort,[3] is formed from κερκίς, the Greek name of the tree, and derived from a fancied resemblance in the fruit to a weaver's implement of that name.

[1] Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 177 (*Pl. Lindheim.* ii.).— Torrey, *Bot. Wilkes Explor. Exped.* 283, t. 3. — Brewer & Watson, *Bot. Cal.* i. 160.

C. Siliquastrum, var., Bentham, *Pl. Hartweg.* 307, 361.

[2] A few common insects, like the Web-worms, occasionally attack Cercis in the United States, although only one is recorded as peculiar to the genus in this country. This is the larva of a little moth *Gelechia cercerisella*, Chambers, said to be very common in it, sometimes folding the leaves together (*Canadian Entomologist*, iv. 108).

[3] *Inst.* 646, t. 414.

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Flowers in sessile clusters; leaves ovate, acute, cordate, or truncate at the base . . . . . 1. C. Canadensis.
Flowers fascicled or slightly racemose; leaves reniform . . . . . 2. C. Texensis.

CERCIS CANADENSIS.

Redbud. Judas Tree.

FLOWERS in sessile clusters. Leaves ovate, acute, cordate, or truncate at the base.

Cercis Canadensis, Linnæus, *Spec.* 374. — Miller, *Dict.* ed. 8, No. 2. — Du Roi, *Harbk. Baum.* i. 147. — Marshall, *Arbust. Am.* 32. — Castiglioni, *Viag. negli Stati Uniti*, ii. 223. — Lamarck, *Dict.* ii. 586. — Wangenheim, *Nordam. Holz.* 84. — Walter, *Fl. Car.* 135. — Willdenow, *Spec.* ii. 508; *Enum.* 439; *Berl. Baumz.* 84. — *Nouveau Duhamel*, i. 19. — Michaux, *Fl. Bor.-Am.* i. 265. — Schkuhr, *Handb.* i. 354. — Persoon, *Syn.* i. 454. — Desfontaines, *Hist. Arb.* ii. 254. — Pursh, *Fl. Am. Sept.* i. 308. — Nuttall, *Gen.* i. 283. — Hayne, *Dendr. Fl.* 53. — Elliott, *Sk.* i. 470. — Torrey, *Fl. N. Y.* i. 188. — De Candolle, *Prodr.* ii. 518. — Sprengel, *Syst.* ii. 346. — Guimpel, Otto & Hayne, *Abbild. Holz.* 116, t. 92. — Hooker, *Fl. Bor.-Am.* i. 167. — Don, *Gen. Syst.* ii. 463. — Spach, *Hist. Vég.* i. 129. — Torrey & Gray, *Fl. N. Am.* i. 392. — Dietrich, *Syn.* ii. 1515. — Darlington, *Fl. Cestr.* ed. 3, 67. — Chapman, *Fl.* 114. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 50. — Koch, *Dendr.* i. 14. — Baillon, *Hist. Pl.* ii. 121. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 65. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 61. — Watson & Coulter, *Gray's Man.* ed. 6, 147.

Siliquastrum cordatum, Moench, *Meth.* 54.

A small tree, sometimes forty or fifty feet in height, with a straight trunk usually separating, ten or twelve feet from the ground, into stout branches which form an upright or often a wide flat head. The bark of the trunk is half an inch thick, and divided by deep longitudinal fissures into long narrow plates, the bright red-brown surface separating into thin scales; that of the branches is smooth and light brown or gray. The branches are slender, glabrous, somewhat geniculate, and covered during their first summer with lustrous brown bark marked by many minute lenticels, which in the second year loses its lustre and grows darker, and in the third becomes a dark or a grayish brown. The winter-buds are obtuse, an eighth of an inch long, and covered with ovate chestnut-brown imbricated scales rounded on the back and slightly ciliate on the margins. The leaves are broadly ovate, often abruptly contracted at the apex into short broad points, truncate or more or less cordate at the base, entire, five to seven-nerved, glabrous with the exception of tufts of white hairs on the lower surface in the axils of the nerves, or sometimes more or less pubescent below.[1] They are from three to five inches in length and breadth, and are borne on slender terete petioles abruptly enlarged at the two ends and from two to five inches long; the stipules are ovate, acute, membranaceous, an eighth of an inch in length, and early deciduous. The leaves turn in the autumn to a bright clear yellow. The flowers, which appear in early spring before or contemporaneously with the leaves, are half an inch long with a dark red calyx and rosy pink petals, and are borne on pedicels from a third to half an inch in length and fascicled four to eight together. The legumes are fully grown in the south by the end of May and at the north by midsummer, and are then pink or rose-color; they are unequally oblong, almost straight on the upper, and curved on the lower edge, and are from two and a half to three and a half inches long. They are produced in great quantities, and fall late in the autumn or in early winter. The seed is bright chestnut-brown and a quarter of an inch long.

Cercis Canadensis is widely distributed from the valley of the Delaware River in New Jersey[2] to the shores of Tampa Bay, northern Alabama and Mississippi, and ranges westward to Missouri, the eastern borders of the Indian Territory, Louisiana, and the valley of the Brazos River in Texas, and reappears on the northeastern slopes of the Sierra Madre of Nuevo Leon. It is a common tree in all this region in glades by the borders of swamps, and on rich bottom-lands forming, especially west of the

[1] *C. Canadensis*, var. *pubescens*, Pursh, *Fl. Am. Sept.* i. 308. — Loudon, *Arb. Brit.* ii. 659.

[2] Britton, *Final Rep. State Geologist, N. J.* ii. 90 (*Cat. Pl. N. J.*).

Alleghany Mountains, an abundant undergrowth to the forest. It grows in immense numbers and to its largest size in southern Arkansas, the Indian Territory, and eastern Texas, where in early spring, when its branches are covered with its brilliant flowers, it makes a beautiful and conspicuous feature of the landscape.

The wood of *Cercis Canadensis* is heavy, hard, although not very strong, and rather coarse grained. It contains numerous thin medullary rays, and bands of from one to three rows of open ducts clearly defining the layers of annual growth. It is rich dark brown tinged with red, with thin lighter colored sapwood composed of eight or ten layers of annual growth. The specific gravity of the absolutely dry wood is 0.6363, a cubic foot weighing 39.65 pounds.

Cercis Canadensis was cultivated in English gardens as early as 1730,[1] and the first description of it was published by Plukenet in the *Almagestum Botanicum* in 1696.[2] The Redbud is a desirable ornament for the garden. It is very hardy far north of its native home and in regions where none of the other species of Cercis can survive; it grows rapidly in good soil, and at the end of a few years, if space is given for its free development, makes a broad-branched flat-topped tree of formal outline, handsome at all seasons of the year, and in flower a striking and delightful object.

[1] Aiton, *Hort. Kew.* ii. 47. — Loudon, *Arb. Brit.* ii. 659.

[2] *Ceratia agrestis, Virginiana, folio rotundo, minori. Fortè Siliqua sylvestris, rotundifolia, Canadensis H. R. P. Schol. Botan.* 95. — Ray, *Hist. Pl.* iii. *Dendr.* 100. *Siliquastrum Canadense,* Tournefort, *Inst.* 647. — Duhamel, *Traité des Arbres,* ii. 264. *Cercis foliis cordatis pubescentibus,* Linnæus, *Hort. Cliff.* 156; *Hort. Ups.* 99. — Clayton, *Fl. Virgin.* 47. — Royen, *Fl. Leyd. Prodr.* 463.

EXPLANATION OF THE PLATES.

Plate CXXXIII. Cercis Canadensis.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. A flower, a portion of the calyx and corolla removed, enlarged.
6. A calyx, enlarged.
7. A stamen, enlarged.
8. A pistil, enlarged.
9. Vertical section of an ovary, enlarged.
10. An ovule, much magnified.

Plate CXXXIV. Cercis Canadensis.

1. A fruiting branch, natural size.
2. A legume, one of the valves removed, natural size.
3. A seed, enlarged.
4. Vertical section of a seed, enlarged.
5. Cross section of a seed, enlarged.
6. An embryo, much magnified.
7. A winter branchlet, natural size.

P. J. Fusion del. Picart fr. sc.

CERCIS CANADENSIS, L.

A. Riocreux direx.t Imp. R. Taneur, Paris.

C.E Faxon del. Picart fr sc

CERCIS CANADENSIS, L.

A. Riocreux direx.t Imp. R. Taneur, Paris.

CERCIS TEXENSIS.

Redbud.

FLOWERS fascicled or slightly racemose. Leaves reniform.

Cercis Texensis, Sargent, *Garden and Forest*, iv. 448.
C. occidentalis, var., Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 177 (*Pl. Lindheim.* ii.). — Walpers, *Ann.* ii. 440.
C. occidentalis, Torrey, *Bot. Mex. Bound. Surv.* 58 (in part). — Hemsley, *Bot. Biol. Am. Cent.* i. 340 (in part).
C. occidentalis, var. Texensis, Watson, *Index*, i. 209.
C. reniformis, Watson, *Proc. Am. Acad.* xvii. 348. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 61. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 91 (*Man. Pl. W. Texas*).

A small slender tree, occasionally twenty or nearly forty feet in height, with a trunk six to twelve inches in diameter; or more often a shrub sending up many stems and forming dense thickets only a few feet high. The bark of the trunk and branches is thin, smooth, and light gray. The branchlets are glabrous and covered with minute white lenticels, and are light reddish brown during their first and second years and dark gray in their third. The leaves, which appear soon after the opening of the flowers in March, are at first light green and slightly pilose; at maturity they are subcoriaceous, dark green and lustrous on the upper, and paler and glabrous or pubescent on the lower surface, and are borne on petioles an inch and a half to two inches long and abruptly contracted at both ends. The flowers are half an inch or rather less in length, and are borne on slender pedicels fascicled in sessile clusters or occasionally racemose, and as long or sometimes twice as long as the flowers, which are rosy pink with a darker colored calyx. The legumes are from two to four inches long and from half an inch to almost an inch broad, and in form and color are hardly to be distinguished from those of *Cercis Canadensis*.

Cercis Texensis is distributed from the neighborhood of Dallas in eastern Texas to the Sierra Madre in Nuevo Leon.[1] It is very common in the valley of the upper Colorado River, and attains its greatest size on the mountains of northeastern Mexico,[2] and here and in many parts of western Texas is a conspicuous feature of vegetation, often forming extensive thickets on the limestone hills and ridges on which the Texas Redbud is found.

The wood of *Cercis Texensis* is heavy, hard, and close-grained, with numerous rather obscure medullary rays, and rows of open ducts marking the layers of annual growth. It is brown streaked with yellow, with thin lighter colored sapwood consisting of five or six layers of annual growth. The specific gravity of the absolutely dry wood is 0.7513, a cubic foot weighing 46.82 pounds.

Cercis Texensis was discovered by Jean Louis Berlandier[3] at Comancheries, in the valley of the lower Rio Grande, in November, 1828.[4]

[1] In the specimen (No. 2080) collected by Pringle in 1888 on the Sierra Madre near Monterey the lower surface of the leaves, the petioles, and the branchlets are coated with hoary canescent tomentum.

[2] C. G. Pringle, *Garden and Forest*, iii. 362.

[3] See i. 82.

[4] *Cercis Texensis* was named by Engelmann in MSS. *Cercis reniformis*, but was not published. See Scheele, *Roemer Texas*, 428, and Brewer & Watson, *Bot. Cal.* i. 161.

EXPLANATION OF THE PLATE.

Plate CXXXV. Cercis Texensis.

1. A flowering branch, natural size.
2. The petals of a flower displayed, natural size.
3. A flower, a portion of the calyx and corolla removed, enlarged.
4. A pistil, enlarged.
5. A fruiting branch, natural size.
6. A portion of a legume, one of the valves removed, natural size.
7. Vertical section of a seed, enlarged.

C. E. Faxon del. Picart fr. sc.

CERCIS TEXENSIS, Sarg.

A Riocreux direx.t Imp. R. Taneur, Paris.

PROSOPIS.

FLOWERS perfect, regular, in axillary cylindrical spikes or globose heads; calyx campanulate, 5-toothed, the teeth valvate in æstivation; petals 5, valvate in æstivation; stamens 10, free; ovary sessile or stipitate, many-ovuled. Legume linear, compressed or subterete, indehiscent. Leaves bipinnate.

Prosopis, Linnæus, *Mant.* 10. — Meisner, *Gen.* 96. — Endlicher, *Gen.* 1324. — Bentham & Hooker, *Gen.* i. 591. — Baillon, *Hist. Pl.* ii. 64.

Algarobia, Bentham, *Pl. Hartweg.* 13. — Torrey & Gray, *Fl. N. Am.* i. 399. — Endlicher, *Gen.* 1324.

Trees or shrubs, with aculeate or naked branches sometimes armed with solitary or geminate axillary spines or spinescent stipules. Leaves bipinnate with two to four or rarely many pinnæ, the pinnæ many or few-foliolate; petioles and petiolules usually furnished with minute or obscure glands; leaflets often rigid; stipules minute or wanting. Flowers usually sessile, in axillary spikes or heads. Calyx five-toothed or slightly five-lobed, deciduous. Petals connate below the middle or ultimately free, glabrous or tomentose on the inner surface towards the apex, sometimes puberulous on the outer surface, hypogynous. Stamens ten, free, inserted with the petals on the margin of a minute obscure disk adnate to the calyx-tube, those opposite the lobes of the calyx rather longer than the others; filaments filiform; anthers oblong, attached on the back below the middle, versatile, introrse, two-celled, the connective tipped with a minute deciduous gland or rarely eglandular, the cells opening longitudinally by marginal sutures. Ovary inserted in the base of the calyx, sessile or stipitate, villose or glabrous, many-ovuled; style filiform, tipped with a minute stigma; ovules suspended in two ranks from the inner angle of the ovary, superposed, anatropous, the micropyle superior. Legume linear, compressed or subterete, straight, falcate, contorted or twisted into a more or less regular spiral, indehiscent; exocarp thin or coriaceous; mesocarp thick, spongy, or hardened, rarely thin; endocarp cartilaginous or papery, inclosing the seeds individually in distinct nutlike joints, or occasionally continuous and scarcely distinguishable from the mesocarp. Seed ovate or oblong, compressed, the hilum near the base; testa crustaceous. Embryo surrounded by a layer of horny albumen; cotyledons flat, the radicle short, straight, slightly exserted.

The genus Prosopis is distributed from the southern borders of the United States to Patagonia, and occurs in tropical Africa, in the Orient, and in tropical and subtropical Asia. Sixteen or seventeen species are distinguished,[1] three of which belong to the Old World. The type of the genus, *P. spicigera*,[2] is found from Persia and Afghanistan to southern India, where in arid regions it sometimes forms extensive forests. *Prosopis Stephaniana*[3] inhabits Cyprus, the Caucasus, Persia, and Afghanistan, extending eastward as far as the Punjab, and *Prosopis oblonga*[4] Upper Guinea and the Nile-land. Two of the species found within the territory of the United States are small trees, and the third, *Prosopis cinerascens*,[5] a native of the valley of the lower Rio Grande, is a low shrub. The other American species are shrubs of Mexico and Peru, and the extratropical countries south of the equator.

[1] Bentham, *Trans. Linn. Soc.* xxx. 376 (*Rev. Mim.*). — Watson, *Proc. Am. Acad.* xxiv. 48. — Brandegee, *Proc. Cal. Acad.* ser. 2, ii. 152 (*Pl. Baja Cal.*).

[2] Linnæus, *Mant.* 68. — De Candolle, *Prodr.* ii. 446. — Boissier, *Fl. Orient.* ii. 634. — Bentham, *l. c.* — Hooker f. *Fl. Brit. Ind.* ii. 288.

[3] Kunth, *Steudel Nom. Bot.* ii. 399. — Boissier, *l. c.* 633. — Bentham, *l. c.* — Hooker f. *l. c.*

[4] Bentham, *Hooker Jour. Bot.* iv. 348; *Trans. Linn. Soc. l. c.* 377. — Oliver, *Fl. Trop. Afr.* ii. 331.

[5] Bentham, *l. c.* 381. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 95 (*Man. Pl. W. Texas*).

Strombocarpa cinerascens, Gray, *Smithsonian Contrib.* iii. 61 (*Pl. Wright.* i.). — Walpers, *Ann.* iv. 614. — Torrey, *Bot. Mex. Bound. Surv.* 60.

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The North American species produce hard durable timber. The wood of *Prosopis spicigera*, a moderate-sized tree, is used in India in making agricultural implements and carts, in buildings, and for furniture; and it is largely employed as fuel on locomotives and steamboats; the pods, like those of the North American species, are used for fodder; and in some districts of India the mealy sweet mesocarp is an important article of food, being eaten raw or cooked with vegetables.[1] This tree is worshiped by the Hindoos at the Dussera Festival.[2]

Numerous insects feed upon the leaves of the North American species, and borers often injure their stems.[3]

The generic name was formed by Linnæus from προσωπίς, employed by Dioscorides to designate the Burdock.

[1] Brandis, *Forest Fl. Brit. Ind.* 170, t. 25. — Aitchison, *Jour. Linn. Soc.* viii. 64.

[2] Brandis, *l. c.*

[3] Little is known yet of the insects which feed on the North American species of Prosopis. *Hemileuca yavapai*, Neumoegen, has been found living on one of the species (*Entomologica Americana*, iii. 167), and *Ægeria prosopis*, H. Edwards, has been taken from galls on *Prosopis juliflora* (*Papilio*, ii. 99). *Chrysobothris octocola*, Leconte, bores into the stems of various species (*Proc. Acad. Nat. Sci. Phil.* 1858, 67), and *Cyllene antennatus*, White, lives in Mesquite wood (G. H. Horn, *Trans. Am. Entomolog. Soc.* viii. 135).

The fruit and seeds of Prosopis, as well as those of the North American species of Acacia and Cercidium, are often destroyed by weevils. The pods of *Prosopis juliflora* are infested by *Bruchus prosopis*, and those of *Prosopis pubescens* by *Bruchus desertorum* (G. H. Horn, *Trans. Am. Entomolog. Soc.* iv. 311. — J. G. Jack, *Garden and Forest*, iv. 280, f. 49).

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

ALGAROBIA. Legume elongated, compressed or ultimately convex; pinnæ twelve to sixteen-foliolate . . . . . 1. P. JULIFLORA.

STROMBOCARPA. Legume thick, spirally twisted; pinnæ ten to sixteen-foliolate . . . . . 2. P. PUBESCENS.

PROSOPIS JULIFLORA.

Mesquite. Honey Locust.

LEGUME elongated, compressed or ultimately convex. Pinnæ 12 to 16-foliolate.

Prosopis juliflora, De Candolle, *Prodr.* ii. 447. — Descourtilz, *Fl. Med. Antil.* viii. 107, t. 550. — Don, *Gen. Syst.* ii. 401. — Dietrich, *Syn.* ii. 1425. — Bentham, *Trans. Linn. Soc.* xxx. 377 (*Rev. Mim.*). — Schnizlein, *Icon.* t. 277, f. 13. — Brewer & Watson, *Bot. Cal.* i. 163. — Rothrock, *Wheeler's Rep.* vi. 42, 106. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 61. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 95 (*Man. Pl. W. Texas*).

Mimosa juliflora, Swartz, *Prodr.* 85; *Fl. Ind. Occ.* 986. — Poiret, *Lam. Dict.* Suppl. i. 76. (Err. typ. *piliflora.*)

Mimosa salinarum, Vahl, *Eclog.* iii. 35.

Acacia Cumanensis, Willdenow, *Spec.* iv. 1058.

Acacia pallida, Willdenow, *Spec.* iv. 1059.

Acacia lævigata, Willdenow, *Spec.* iv. 1059.

Acacia juliflora, Willdenow, *Spec.* iv. 1076.

Acacia furcata, Desvaux, *Jour. Bot.* v. 67.

Acacia diptera, Willdenow, *Enum.* 1051.

Mimosa pallida, Poiret, *Lam. Dict.* Suppl. i. 65.

Mimosa Cumana, Poiret, *Lam. Dict.* Suppl. i. 65.

Mimosa lævigata, Poiret, *Lam. Dict.* Suppl. i. 65.

Mimosa furcata, Desfontaines, *Cat. Hort. Paris*, ed. 2, 207.

Acacia flexuosa, Lagasca, *Elench. Hort. Matrit.* 16.

Acacia Siliquastrum, Lagasca, *Elench. Hort. Matrit.* 16.

P. horrida, Kunth, *Mim.* 106, t. 33. — Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 306. — De Candolle, *Prodr.* ii. 446. — Sprengel, *Syst.* ii. 326. — Don, *Gen. Syst.* ii. 400. — Spach, *Hist. Vég.* i. 63. — Dietrich, *Syn.* ii. 1424.

P. pallida, Kunth, *Mim.* 106. — Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 309. — Sprengel, *Syst.* ii. 326. — De Candolle, *Prodr.* ii. 447. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1424.

P. Cumanensis, Kunth, *Mim.* 106. — Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 310. — De Candolle, *Prodr.* ii. 447. — Sprengel, *Syst.* ii. 326. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1425.

P. dulcis, Kunth, *Mim.* 110, t. 34. — Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 307. — De Candolle, *Prodr.* ii. 447. — Sprengel, *Syst.* ii. 326. — Don, *Gen. Syst.* ii. 400. — Spach, *Hist. Vég.* i. 63. — Dietrich, *Syn.* ii. 1424.

Desmanthus salinarum, Steudel, *Nom. Bot.* i. 493.

P. inermis, Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 307. — De Candolle, *Prodr.* ii. 447. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1424.

P. Siliquastrum, De Candolle, *Prodr.* ii. 447. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1424.

P. flexuosa, De Candolle, *Prodr.* ii. 447. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1424. — Hooker & Arnott, *Hooker Bot. Misc.* iii. 203.

P. bracteolata, De Candolle, *Prodr.* ii. 447. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1425.

P. Domingensis, De Candolle, *Prodr.* ii. 447. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1425.

Acacia? salinarum, De Candolle, *Prodr.* ii. 456.

P. affinis, Sprengel, *Syst.* ii. 326. — Don, *Gen. Syst.* ii. 401.

P. glandulosa, Torrey, *Ann. Lyc. N. Y.* ii. 192, t. 2; *Emory's Rep.* 139; *Pacific R. R. Rep.* iv. 82. — Don, *Gen. Syst.* ii. 400. — Dietrich, *Syn.* ii. 1424. — Walpers, *Rep.* i. 861. — Bentham, *Hooker Jour. Bot.* iv. 348; *Lond. Jour. Bot.* v. 81. — Watson, *King's Rep.* v. 420.

Algarobia glandulosa, Torrey & Gray, *Fl. N. Am.* i. 399; *Pacific R. R. Rep.* ii. 164. — Engelmann & Gray, *Jour. Bost. Soc. Nat. Hist.* v. 242 (*Pl. Lindheim.* i.). — Engelmann, *Wislizenus Memoir of a Tour to Northern Mexico* (*Senate Doc.* 1848) Bot. Appx. 94. — Scheele, *Roemer Texas*, 427. — Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 181 (*Pl. Lindheim.* ii.); *Smithsonian Contrib.* iii. 60; v. 51 (*Pl. Wright.* i., ii.); *Ives' Rep.* 11. — Torrey, *Sitgreaves' Rep.* 158; *Pacific R. R. Rep.* iv. 82; vii. 10; *Bot. Mex. Bound. Surv.* 60.

Algarobia dulcis, Bentham, *Pl. Hartweg.* 13.

P. fruticosa, Meyen, *Reise*, i. 376.

P. odorata, Torrey, *Frémont's Rep.* 313, t. 1 (excl. fruit).

A tree, occasionally forty or fifty feet in height, with a trunk rarely two feet in diameter and seven to ten feet long, but usually not more than six to twelve inches in diameter, and divided, a short distance above the ground, into many irregularly arranged crooked branches forming a loose straggling head; or occasionally, when grown under the most favorable conditions, a shapely tree with a round symmetrical head; or often a shrub with slender stems sometimes only a few inches in height. The principal roots with a large thick tap-root descend vertically to a depth sometimes of forty or fifty feet, and are supplemented by radiating horizontal roots which spread in all directions and form a dense mat

in the subsoil.[1] The bark of the trunk is thick, dark reddish brown, and divided by shallow fissures, the surface separating into short thick scales. The branchlets are slender, glabrous, or pubescent, at first pale yellow-green, and rather darker in their second year, when they are usually more or less zigzag and are often marked with minute dark lenticels and irregularly shaped red blotches. The winter-buds are obtuse and are covered with acute apiculate dark brown scales. The branches are furnished at the axils of the leaves of their first season with short thick spur-like excrescences covered with chaffy scales, and are usually armed with stout straight terete supra-axillary persistent spines which vary from half an inch to two inches in length, or the branches are sometimes unarmed. The leaves are alternate on the branchlets of the year and fascicled in the axils of those of previous years; they have two or rarely four pinnæ, and are glabrous or pubescent, and deciduous. The petiole is terete, two to four inches in length, with an abruptly enlarged glandular base, and is furnished at the apex with a minute gland and tipped with the slender subulate spinescent rachis. The pinnæ are from three to six inches long, with petioles enlarged and glandular at the base, and terete or slightly winged rachises, each bearing from eight to fifteen pairs of oblong or linear entire acute or obtuse and often apiculate rigid leaflets. These vary from one to two inches in length and from an eighth to a quarter of an inch in breadth; they are conspicuously reticulate-veined, strengthened by broad thick midribs, and are sessile or borne on short stout glandular petiolules, and are sometimes remote and sometimes placed close together, standing in all positions on the rachis, as often in vertical or oblique as in horizontal planes.[2] The stipules are linear, acute, membranaceous, and deciduous. The flowers, which are a twelfth of an inch long, are greenish white and fragrant, and are produced on short pedicels from the axils of minute scarious deciduous bracts in slender cylindrical spikes which vary from an inch and a half to four inches in length; these are densely or occasionally interruptedly flowered, and are borne on stout peduncles from half an inch to three quarters of an inch long, and when the flowers are open appear bright yellow from the numbers of largely exserted anthers. The calyx is glabrous and is barely a quarter of the length of the narrowly oblong acute petals. These are slightly puberulous or glabrous on the outer surface and covered on the inner surface towards the apex with thick white tomentum which appears as a tuft at the apex of the flower-bud. The stamens are straight or diverging and twice as long as the corolla, the large dark-colored connective of the anther cells bearing a stalked gland. The ovary is shortly stipitate and clothed with silky hairs. The flowers begin to appear in May, and are produced in successive crops until the middle of July. The legumes are linear, compressed at first, subterete at maturity, constricted between the seeds, of which there are usually from ten to twenty, straight or falcate, and contracted at the two ends, the apex being tipped with the straight or recurved remnant of the style; they vary from four to nine inches in length and from a quarter of an inch to half an inch in width. The outer coat is thin and ligneous, longitudinally veined, and pale yellow or straw-color often marked with

[1] The roots of the Mesquite appear to develop almost independently of the leaves, and often attain an enormous size on plants with stems a few inches in height and with only a small quantity of foliage. The tap-root, which is the only one of the vertical roots that grows to a large size, often descends to a great depth in search of water, and does not branch or decrease much in diameter until this is reached. The Mesquite is thus enabled to extract an unfailing supply of water from low strata, and is not dependent on the moisture of the subsoil. Its presence and condition afford almost certain indications of the depth of the water-level; when the plant attains the size of a tree this will be found within forty or fifty feet of the surface, or, when it grows as a thrifty bush, within fifty or sixty feet; when the roots are forced to descend below sixty feet, the stems are not more than two or three feet high. Sand heaped by the wind about the stems of the plants causes the development of secondary vertical roots and branches which hold more sand and earth, and gradually form mounds, often of considerable size and height, upon which the plants appear to be growing.

The value of the Mesquite is greatly increased by the remarkable development of its roots, which enables it to reach a deep water-level and flourish where no other ligneous plant can exist; these roots furnish large quantities of valuable fuel, which is dug from the ground or dragged out by oxen in pieces fifteen or twenty feet long in regions where no wood of fuel value is produced above ground. (Havard, *Am. Nat.* xviii. 454.)

The weight of the wood of the root, as shown by the result of the tests published in Volume IX. of the 10th Census of the United States, is considerably greater than the average weight of many specimens taken from trunks grown in different regions, its specific gravity being 0.8493.

[2] Havard (*l. c.* 453) found 63,660 stomata to the square inch on the upper surface of the leaflets of *Prosopis juliflora*, and 143,235 on the lower surface, as the mean of several observations.

red; this surrounds a thick spongy layer of sweet pulp in which the seeds are placed obliquely, separately inclosed in thin envelopes forming nut-like joints quadrate by mutual pressure. The seeds are oblong, flattened, with a thin light brown lustrous testa and thin horny albumen.[1]

Prosopis juliflora is distributed in the United States from the southern borders of Colorado and Utah through New Mexico, the southern borders of the Indian Territory and northern and western Texas to the Rio Grande, and through southern Nevada and Arizona to southern California. The eastern limits of its range may be represented by a line extending from a point where the thirty-seventh parallel of latitude intersects the one hundredth meridian to the neighborhood of Dallas in Texas, and then southward to the valley of the Colorado and along the Gulf at a distance of twenty or thirty miles from the coast, which it reaches near the mouth of the Rio Grande; and its western limit by a line extending from the Tejon Pass in California by Los Angeles to San Pedro on the Pacific coast. The Mesquite is generally distributed through northern Mexico[2] and Lower California,[3] and is abundant in the Andean region, extending south as far as Chile; it is widely spread in the Argentine Republic, and has become naturalized in the arid regions of southern Brazil[4] and in the drier parts of the island of Jamaica.[5]

In the United States the Mesquite attains its greatest size in those bottom-lands of the rivers of southern Arizona where it is protected from the wind and where the water-level is not far below the rich porous surface of the soil. Favored by such conditions it often forms open forests of considerable extent; it is at home on rich prairies, from which fire recurring year after year cannot drive it, on arid rocky hills, on sandy and saline flats, and on shifting sand dunes. A hot dry climate with mild winters, a small rainfall, and a clear atmosphere suits it best; but it can withstand many degrees of frost, and in tenacity of life and ability to struggle against conditions which would exterminate most plants it is not surpassed by any other tree.

The wood of *Prosopis juliflora* is heavy, hard, and close-grained, although not very strong; it contains numerous distinct medullary rays and many evenly distributed open ducts, and is rich dark brown or sometimes red, with thin clear yellow sapwood. The specific gravity of the absolutely dry wood is 0.7652, a cubic foot weighing 47.69 pounds. It is almost indestructible in contact with the soil, and is valued and largely used for fence-posts and railway ties; it furnished the underpinnings and timbers of the adobe buildings of the early inhabitants of western Texas, New Mexico, Arizona, and northern Mexico; it is sometimes used in furniture, for the fellies of heavy wheels, and for the pavements of city streets; and it affords the best and often the only fuel in the regions where it grows, burning slowly with a bright clear flame. It produces valuable charcoal, but is unsuited for the generation of steam on account of the destructive action upon boilers of the tannin[6] which it contains. The

[1] The variations in the size and shape of the leaflets of *Prosopis juliflora*, the absence or presence of spines on different branches of the same individual or at different periods of its growth, and the innumerable forms assumed by the fruit in ripening have led to the publication of a large number of species which were often established upon fragmentary specimens, and are now referred to it by Bentham as synonyms. (See Bentham, *Trans. Linn. Soc.* xxx. 378 [*Rev. Mim.*].)

[2] Hemsley, *Bot. Biol. Am. Cent.* i. 344.

[3] Brandegee, *Proc. Cal. Acad.* ser. 2, ii. 152 (*Pl. Baja Cal.*).

[4] Bentham, *Martius Fl. Brasil.* xv. pt. ii. 289.

[5] According to Browne (*Nat. Hist. Jam.* 252) *Prosopis juliflora*, which he called "*Mimosa diffusa, spica oblonga, siliquis lorgioribus compressis*," had been introduced into Jamaica from the mainland and was already (1756) flourishing "luxuriantly in many parts of the lowlands, where it is observed to rise, frequently to the height of fourteen or fifteen feet, or better." (See also Barham, *Hort. Amer.* 150. — Lunan, *Hort. Jam.* i. 156. — Macfadyen, *Fl. Jam.* 311.)

[6] An analysis of the wood of *Prosopis juliflora* made by the chemist of the Department of Agriculture of the United States shows 6.21 per cent. of tannic acid in the heartwood, 0.50 per cent. in the sapwood, and 0.50 per cent. in the bark. (W. McMurtree, *Rep. Dept. Agric.* 1873, 183.) It is almost identical with the tannic acid found in oak-galls, although it is claimed that it acts more quickly on animal tissues and penetrates hides more rapidly than either oak or sumach tannin. The color of the heartwood is due to a pigment probably associated with the tannin, the two being extricable together by hydrated ether; and Havard suggests (*Am. Nat.* xviii. 458) that the relative proportion of tannin in any log can be judged of by the extent and deepness of its color, and that, like the color, it increases with the age of the tree. An astringent decoction obtained by boiling chips of the heartwood may be used to check diarrhœa or dysentery, or by infusion to purify muddy or stagnant water. (Havard, *l. c.*)

ripe pods[1] of the Mesquite supply the Mexicans and Indians with a favorite and nutritious food, and are greedily devoured by most herbivorous animals.[2] A gum resembling gum arabic[3] exudes from its stems.

From the shores of the Gulf of Mexico to those of the Pacific Ocean the Mesquite is the most important tree of the districts immediately north and south of the boundary of the United States; it is the most valuable leguminous tree of the North American forests, and the amount and quality of the food and fuel which it produces in vast territories where both are scarce make it one of the most valuable of all trees. In spring and summer its bright green foliage and abundant fragrant flowers give life and beauty to dreary desert slopes and arid plains, and delight the eye of the traveler, who, however, in the broken and illusory shadows cast by its thin and scattered leaves, vainly seeks protection from the burning rays of the sun.[4]

The earliest botanical account of *Prosopis juliflora* was published in 1788 by the Swedish traveler Swartz, who had found it naturalized in Jamaica. It was first found within the territory of the United States, in the valley of the Canadian River near the northern limits of its distribution, in 1820, by Dr. Edwin P. James,[5] the naturalist of Long's Rocky Mountain Expedition. It was introduced into England from Chile in 1832,[6] and is now cultivated in most of the warm dry parts of the world as an ornamental or fodder plant,[7] or in hedges, for which its hardiness and stout well-armed branches make it valuable.

Prosopis juliflora is easily raised from seeds,[8] which readily germinate and produce plants that grow rapidly in good soil, and at the end of four or five years form shrubs with stems several feet in height.

[1] The nutritious portion of a Mesquite pod is about fifty-three per cent. and consists of vegetable albumen, gum, and grape-sugar, with traces of fat and salts. The remainder, or nearly one half, made up of the outer and inner walls of the pod and of the seeds, is indigestible and always voided. As only about one half of their weight is assimilable, Mesquite pods furnish much less valuable fodder than oats or corn; it is rich in sugar and nitrogen but deficient in starch and salts. The unripe pods are bitter and of no value as food; when fully ripe they fall to the ground and should then be collected at once and stored in a dry place when they will keep until the crop of the following year ripens; if left upon the ground they soon deteriorate and decay.

Mesquite pods are largely consumed by Mexicans and Indians, who grind them into coarse flour which they bake, after picking out the seeds, into cakes or tomales. Mesquite atole is made by boiling the pods and pounding them in fresh water into a pulp; the liquid, which contains in suspension and solution all the nutritious portion of the fruit, is then strained and makes a pleasant and healthful beverage. An infusion of Mesquite flour can be fermented and brewed into a weak beer, once largely used by the Apache and Comanche Indians. (See Havard, *Am. Nat.* xviii. 459.)

[2] Gray, *Mem. Am. Acad.* n. ser. v. 304 (*Pl. Thurber.*).

[3] The gum which exudes from the bark of the Mesquite from May to September concretes in tears of various sizes and of a bright amber color. It is usually found on old trees with thick furrowed bark, accumulated in knot-holes and on the edges of wounds, and less commonly on smooth young stems. Sometimes the exudation does not concrete but spreads out on the bark in large flat resinous patches. Mesquite gum has the taste of gum arabic, from which it differs in not being affected by subacetate of lead; it dissolves readily in three parts of water, and makes excellent mucilage. The quantity of gum naturally produced in a season by a large tree perhaps does not exceed half a pound, although the flow can be increased by making incisions in the bark, and it is not probable that Mesquite gum will ever become an important article of commerce. (Rosenthal, *Syn. Pl. Diaphor.* 1052. — *Rep. Dept. Agric. U. S.* 1872, 452. — Havard, *l. c.*)

[4] *Prosopis juliflora* is called Algaroba and its pods Algarobo by the Spanish-speaking inhabitants of Central and South America.

[5] See ii. 96.

[6] Loudon, *Arb. Brit.* ii. 661. — Nicholson, *Dict. Gard.*

[7] F. Mueller, *Select Plants readily eligible for Industrial Culture or Naturalization in Victoria*, 185. — Naudin, *Manuel de l'Acclimateur*, 439.

[8] A large proportion of the seeds do not grow without aid, through their failure to find suitable conditions for germination. Many decay where they fall, or are destroyed by insects, and the spontaneous growth of seedlings occurs only in favorable seasons at irregular intervals of years. The principal agencies for disseminating the seeds are water which rushes down gulches and arroyos after heavy rains, and carries the pods to the banks and bottom-lands of rivers, where they find conditions favorable for germination, as the Mesquite forests common in such situations attest, and herbivorous animals which void the seeds without having destroyed their vitality. The seedlings usually spring up in clusters, owing to the germination of several of the seeds from a single pod; on rich land the strongest of these takes the lead, gradually destroying the others, and forms a tree; on higher and drier land several of the seedlings develop equally and form a cluster of stems more or less united at the base.

The Mesquite grows rapidly in good soil during the first four or five years of its life. Later its increase is slow; in thirty years it may form a stem seven or eight inches in diameter which during the next fifty years may, under favorable conditions, increase three or four inches. Trunks more than a foot in diameter are probably over a hundred years old. (Havard, *l. c.* 456.)

EXPLANATION OF THE PLATES.

PLATE CXXXVI. PROSOPIS JULIFLORA.

1 and 2. Flowering branches, natural size.
3. Diagram of a flower.
4. A flower, enlarged.
5. Vertical section of a flower, enlarged.
6. Front and back view of a stamen, enlarged.
7. Vertical section of an ovary, enlarged.
8. An ovule, much magnified.

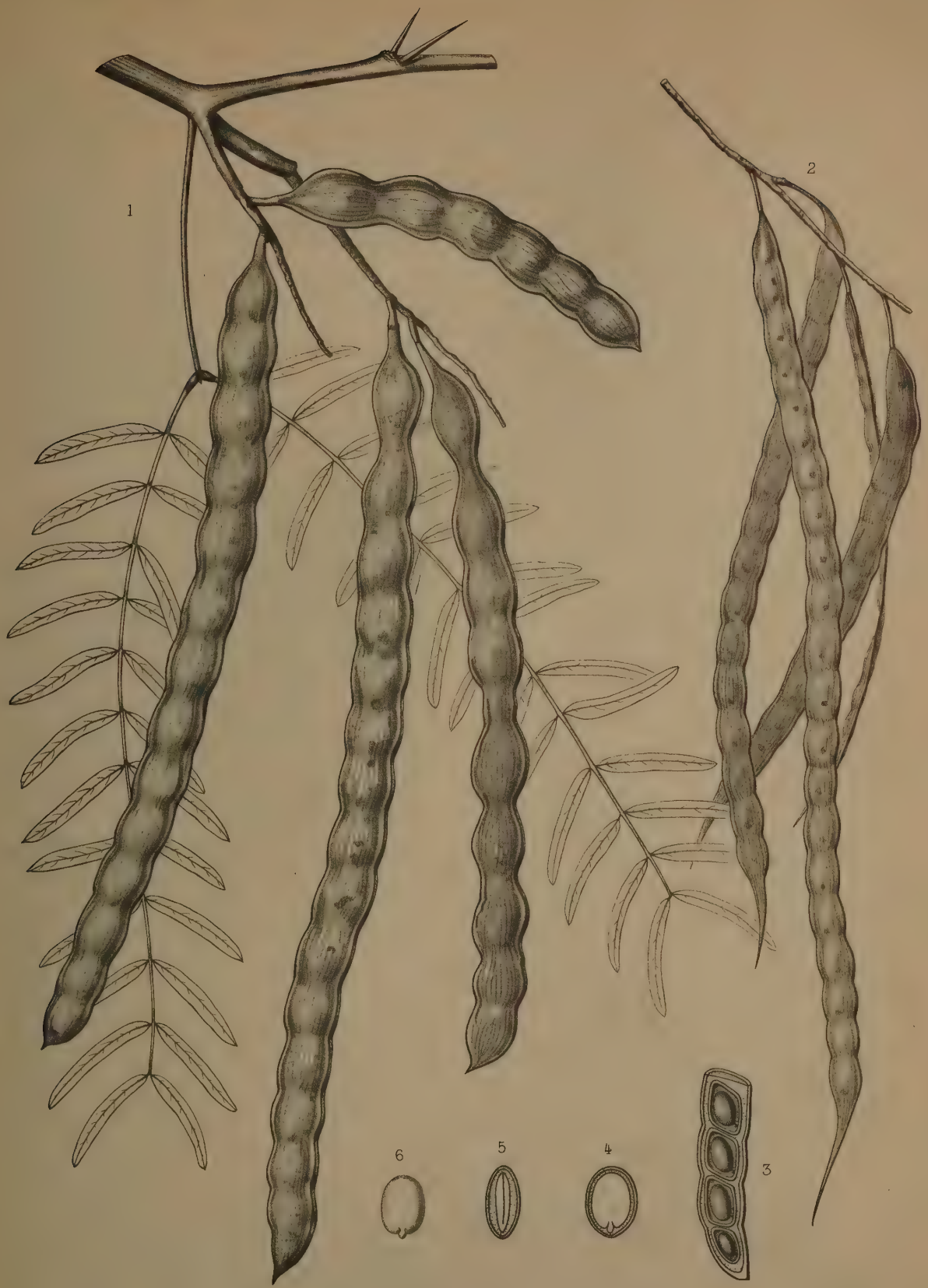
PLATE CXXXVII. PROSOPIS JULIFLORA.

1. A fruiting branch, natural size.
2. A cluster of half-grown fruit, natural size.
3. Vertical section of a portion of a legume, natural size.
4 and 5. Vertical sections of a seed, enlarged.
6. An embryo, magnified.

C E Faxon del. Picart fr sc.

PROSOPIS JULIFLORA, DC.

A. Riocreux direx.t Imp. R. Taneur, Paris.



C E Faxon del. Picart fr. sc.

PROSOPIS JULIFLORA, DC.

A. Riocreux direx.t Imp. R. Taneur, Paris.

PROSOPIS PUBESCENS.

Screw Bean. Screw Pod Mesquite.

LEGUME thick, spirally twisted. Pinnæ 10 to 16-foliolate.

Prosopis pubescens, Bentham, *Lond. Jour. Bot.* v. 82; *Trans. Linn. Soc.* xxx. 380 (*Rev. Mim.*). — Walpers, *Ann.* i. 259. — Watson, *King's Rep.* v. 420. — Brewer & Watson, *Bot. Cal.* i. 163. — Rothrock, *Wheeler's Rep.* vi. 42, 107. — Hemsley, *Bot. Biol. Am. Cent.* i. 344. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 62. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 95 (*Man. Pl. W. Texas*).

P. odorata, Torrey, *Frémont's Rep.* 313, t. 1 (excl. flowers).

P. Emoryi, Torrey, *Emory's Rep.* 139.

Strombocarpa pubescens, Gray, *Smithsonian Contrib.* iii. 60; v. 51 (*Pl. Wright.* i., ii.); *Ives' Rep.* 9. — Torrey & Gray, *Pacific R. R. Rep.* ii. 263. — Torrey, *Pacific R. R. Rep.* iv. 11, 20, 82; v. 360, t. 4; vii. pt. iii. 10; *Bot. Mex. Bound. Surv.* 60.

Strombocarpa odorata, Torrey, *Sitgreaves' Rep.* 158.

A small tree, rarely twenty-five or thirty feet in height, with a slender trunk sometimes a foot in diameter; or more often a tall many-branched shrub. The bark of the trunk is thick and light brown tinged with red, and exfoliates in long thin persistent ribbon-like scales.[1] The branches are terete, armed with stout rigid geminate supra-axillary spines; they are canescently pubescent or glabrate when they first appear, but glabrous in their third year, when they are covered with light red-brown bark. The leaves are alternate on the young shoots and fascicled in the axils of the leaves of the previous years, canescently pubescent, and deciduous; they are two or three inches long, each with a slender petiole from a third to two thirds of an inch in length bearing a minute gland near the apex, which is tipped with a small spinescent rachis, and two pinnæ each an inch and a half or two inches long with five or eight pairs of oblong or somewhat falcate acute sessile or shortly petiolulate leaflets, often apiculate, conspicuously reticulate-veined, and from a third to two thirds of an inch in length and an eighth of an inch in breadth. The stipules are spinescent and deciduous. The flowers, which begin to open in early spring, are produced in successive crops, and are greenish white; they are sessile from the axils of minute scarious deciduous bracts, and are borne in dense or interrupted cylindrical pedunculate spikes two or three inches in length. The calyx is obscurely five-lobed, pubescent on the outer surface, one third or one fourth as long as the narrow acute petals coated on the inner surface near their apex with thick white tomentum, and slightly puberulous on the outer surface. The ovary and young fruit are covered with pale tomentum. The legumes, which are borne in dense racemes, are sessile and are twisted with from twelve to twenty turns into a narrow straight spiral one or two inches in length. The outer coat of the legume is thin and woody and of a pale straw color; it incloses the thick sweet pulp of the mesocarp in which are the seeds, wrapped in separate envelopes and flattened by mutual pressure. The seeds are obovate, a sixteenth of an inch long, with a thick very hard pale brown testa and thin horny albumen. The fruit ripens throughout the summer, and falls in the autumn.

Prosopis pubescens is common in the valley of the Rio Grande in western Texas, from the mouth of the Devil's River to El Paso; it extends westward through New Mexico and Arizona, and in California through the arid region of the Colorado basin to San Diego County; it reaches the southern borders of Utah and Nevada, and extends southward into northern Mexico. It occupies sandy or gravelly bottom-lands, and attains its greatest size in the United States in the valleys of the lower Colorado and Gila rivers.

[1] The bark on an old trunk of *Prosopis pubescens* has a shaggy appearance like that of a very old Grape-vine or of a large-stemmed *Cowania Mexicana*.

The wood of *Prosopis pubescens* is heavy, and exceedingly hard and close-grained, but brittle and not very strong. It contains numerous thin medullary rays and many evenly distributed open ducts, and is light brown with thin lighter colored sapwood composed of six or seven layers of annual growth. The specific gravity of the absolutely dry wood is 0.7609, a cubic foot weighing 47.42 pounds. It is somewhat employed for fencing, and makes excellent fuel. The pods are used for fodder, and are sweet and nutritious, although their small size and the hardness of the seeds make them less valuable than those of the Mesquite.[1]

Prosopis pubescens[2] was discovered by Frémont in the Mohave Desert in 1843, during his second transcontinental journey.

[1] Havard, *Proc. U. S. Nat. Mus.* viii. 499.

[2] *Prosopis pubescens* is called Tornillo by the Mexicans.

EXPLANATION OF THE PLATE.

Plate CXXXVIII. Prosopis pubescens.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. A stamen, enlarged.
5. A fruiting branch, natural size.
6. Vertical section of a portion of a legume, enlarged.
7. Vertical section of a seed, enlarged.
8. A seed, enlarged.
9. Vertical section of a seed, enlarged.
10. An embryo, magnified.

C.E Faxon del. Picart fr. sc.

PROSOPIS PUBESCENS, Benth.

A. Riocreux direx.t Imp. R. Taneur, Paris.

LEUCÆNA.

FLOWERS in globular heads; calyx 5-toothed, the teeth valvate in æstivation; petals 5, valvate in æstivation, free; stamens 10, free; ovary stipitate, many-ovuled. Legume broadly linear, plano-compressed, 2-valved. Leaves abruptly bipinnate.

Leucæna, Bentham, *Hooker Jour. Bot.* iv. 416. — Meisner, *Gen.* pt. ii. 353. — Bentham & Hooker, *Gen.* i. 594. — Baillon, *Hist. Pl.* ii. 67.

Trees or shrubs, with branches usually unarmed. Leaves alternate, persistent, bipinnate, petiolate, the petioles often furnished with a conspicuous gland below the lower pair of pinnæ; leaflets small, in many pairs, or few, large, and oblique; stipules setaceous, minute, or ample, deciduous, rarely becoming spinescent and persistent.[1] Flowers white, mostly perfect, sessile in the axils of small bractlets, imbricated in globose pedunculate heads, the peduncles in axillary fascicles or in leafless terminal racemes, sometimes bibracteate near the apex. Calyx tubular-campanulate, minutely five-toothed, deciduous. Petals five, acute or rounded at the apex, narrowed at the base, hypogynous. Stamens ten, free, inserted under the ovary, exserted; filaments filiform; anthers ovate, oblong, or globose, eglandular, attached on the back near the middle, versatile, usually pilose, two-celled, the cells opening longitudinally. Ovary stipitate, many-ovuled, contracted into a long slender style; stigma terminal, minute, slightly dilated; ovules attached in two ranks on the inner angle of the ovary, superposed, anatropous, the micropyle superior. Legume many-seeded, stipitate, linear, compressed, tipped with the remnants of the style, dehiscent, the valves thickened on the margins, rigid, membranaceous, continuous within; exocarp thin and papery, dark-colored, the endocarp rather thicker, woody, pale brown. Seed obovate, compressed, transverse, the hilum near the base; funicle long and slender; testa thin, crustaceous, brown and lustrous. Embryo inclosed on its two sides by a thin layer of horny albumen; cotyledons oval, flat, the radicle straight, slightly exserted.

Leucæna is represented by nine or ten species.[2] One[3] inhabits the islands of the Pacific Ocean from New Caledonia to Tahiti, and the others the warmer parts of America, where they are distributed from western Texas through Mexico to Lower California and to Central America, Peru, Venezuela, and San Domingo. Three species occur within the territory of the United States. *Leucæna retusa*[4] is a slender shrub, abundant in some parts of Texas west of the Colorado River and reaching the borders of New Mexico; the others are small trees.

Leucæna is not known to possess useful properties.

The genus was established by Bentham to receive a number of plants previously referred to Acacia, which they resemble in habit and in the appearance of the fruit; this, however, in the character of the valves and in the albumen of the seeds approaches the fruit of Desmanthus rather than that of Acacia, while the flowers are similar to those of Mimosa.

The generic name, from λευκαίνω, refers to the color of the flowers.

[1] The stipules of *Leucæna Greggii* (Watson, *Proc. Am. Acad.* xxiii. 272), a small tree of northern Mexico, are triangular, ovate, and contracted into long slender points which become rigid and spinescent, and remain on the branches for at least a year as slender geminate spines, sometimes a third or nearly half an inch in length. There are traces of similar spinescent stipules also on *Leucæna macrophylla* (Bentham, *Bot. Voy. Sulphur*, 90).

[2] Bentham, *Trans. Linn. Soc.* xxx. 444 (*Rev. Mim.*).—Watson, *l. c.*

[3] *Leucæna glandulosa.*

L. Fosteri, Bentham, *Hooker Lond. Jour. Bot.* v. 94; *Trans. Linn. Soc.* xxx. 442.

Mimosa glandulosa, Foster, *Prodr.* 92.

Acacia glandulosa, Guillemin, *Ann. Sci. Nat.* ser. 2, vii. 360.

[4] Bentham; Gray, *Smithsonian Contrib.* iii. 64 (*Pl. Wright.* i.); *Trans. Linn. Soc.* xxx. 443. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 98 (*Man. Pl. W. Texas*).

CONSPECTUS OF THE NORTH AMERICAN SPECIES.

Branchlets slightly tomentose or glabrous; peduncles bibracteate at the apex; pinnæ twenty to forty-foliolate . . . . . 1. L. GLAUCA.

Branchlets pulverulent-tomentose; peduncles ebracteolate; pinnæ sixty to one hundred and twenty-foliolate . . . . . 2. L. PULVERULENTA.

LEUCÆNA GLAUCA.

BRANCHLETS slightly tomentose or glabrate at maturity. Leaves 16 to 18-pinnate, the pinnæ 20 to 40-foliolate.

Leucæna glauca, Bentham, *Hooker Jour. Bot.* iv. 416; *Trans. Linn. Soc.* xxx. 443 (*Rev. Mim.*). — Walpers, *Rep.* i. 884. — Dietrich, *Syn.* v. 477. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 62. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 98 (*Man. Pl. W. Texas*).

Mimosa glauca, Linnæus, *Spec.* 520. — Persoon, *Syn.* ii. 265. — Poiret, *Lam. Dict.* Suppl. i. 75.

Mimosa leucocephala, Lamarck, *Dict.* i. 12.

Acacia glauca, Willdenow, *Spec.* iv. 1075. — De Candolle, *Prodr.* ii. 467. — Sprengel, *Syst.* iii. 139. — Don, *Gen. Syst.* ii. 418.

Acacia biceps, Willdenow, *Spec.* iv. 1075. — De Candolle, *Prodr.* ii. 467. — Don, *Gen. Syst.* ii. 418.

Acacia frondosa, Willdenow, *Spec.* iv. 1076. — De Candolle, *Prodr.* ii. 468.

Mimosa biceps, Poiret, *Lam. Dict.* Suppl. i. 75.

Mimosa frondosa, Poiret, *Lam. Dict.* Suppl. i. 76.

Acacia leucocephala, Link, *Enum.* ii. 444. — De Candolle, *Prodr.* ii. 467. — Sprengel, *Syst.* iii. 139. — Don, *Gen. Syst.* ii. 418.

A slender tree, with graceful spreading foliage, occasionally rising to the height of twenty or thirty feet, with a stem three or four inches in diameter; or more often a broad shrub sending up many stems from the ground. The bark of the trunk is three eighths of an inch thick, slightly ridged and dark brown, the surface being broken into short persistent scales. The branchlets when they first appear are coated with short pale pubescence, which gradually disappears, and in their second year they are glabrate or only slightly puberulous. The leaves are ten or twelve inches long and six or eight inches broad, with stout terete petioles enlarged at the base and an inch and a half to three inches in length, sometimes eglandular and sometimes on the same individual furnished with a large conspicuous dark gland opposite the lower pair of pinnæ or between these and its base. The stipules are minute, subulate, and caducous. The pinnæ are remote and three or four inches in length, with entire acute sessile or shortly petiolulate leaflets; these are oblique or unequal at the base, and from a third to half of an inch long, paler on the lower than on the upper surface, and at maturity occasionally slightly pilose along the margins and on the under surface; their midribs are broad and orange-colored for a third of their length, and narrow and obscure above the middle of the blade. The flower-heads are ovate before anthesis and globose at maturity, two thirds of an inch in diameter, and borne on stout pubescent peduncles; these are furnished at the apex with two irregularly three-lobed pubescent bracts, and are solitary or fascicled two or three together in the axils of the upper leaves, or are arranged in short terminal racemes, the branches springing from the axils of small scarious bracts. The flowers are numerous, sessile, and produced from the axils of minute peltate bractlets borne on long slender stalks which lengthen with the growing buds; these are oblong, obtuse, and densely coated with pale tomentum. The calyx is a twelfth of an inch long, very short-toothed, covered with pale tomentum, and half the length of the petals, which are narrow, acute, and rounded at the apex. The stamens are twice as long as the petals and have slender filaments and large oval bright yellow pilose anthers. The ovary is glabrous or often more or less covered with thin scattered hairs. The legumes are from four to seven inches long and from a half to two thirds of an inch broad, obtuse or acute at the apex, long-stalked, and furnished with a short recurved point; they are pubescent until nearly half-grown, and at maturity are bright chestnut-brown and glabrous or somewhat puberulous towards the base. Two or three or sometimes as many as ten or twelve, often of different lengths, are produced together on a single peduncle abruptly and conspicuously thickened at the apex. The seeds are obovate, two thirds of an inch long, rounded at the apex and contracted at the base; the testa is thin, bright chestnut-brown, and lustrous.

Leucæna glauca is probably a native of the warmer parts of the New World; but it has been cultivated so long and has now established itself so firmly in most of the tropical countries of both hemispheres that its origin is uncertain. It occurs in western Texas from San Saba to the valley of the Devil's River in many localities so remote from human habitations that it hardly seems possible it could have reached them through the agency of man. It is widely scattered through Mexico and Central America,[1] and many of the countries of South America, extending at least as far south as southern Brazil.[2] It has become naturalized in most of the West India and Bahama Islands[3] and on Key West in Florida,[4] and is now common in tropical Africa[5] and Asia,[6] and on the islands of the Pacific Ocean.[7] In Texas and northern Mexico *Leucæna glauca* inhabits dry rocky hillsides and the sides of depressions in the desert, or is occasionally found near the borders of small streams.

The wood of *Leucæna glauca* is heavy, hard, and close-grained, and contains many small regularly distributed open ducts. The layers of annual growth and the medullary rays are hardly distinguishable. It is rich brown streaked with red, with thin clear yellow sapwood. The specific gravity of the absolutely dry wood is 0.9235, a cubic foot weighing 57.55 pounds.

Leucæna glauca appears to have been first described in 1690 by Kiggelaer[8] in his catalogue of the plants cultivated in the garden of Simon van Beaumont, of Dordrecht, and in the same year was in cultivation in the gardens of Hampton Court.[9] The beauty of its large pale finely divided leaves, its showy heads of flowers produced in the tropics throughout the year, and its handsome fruit, must early have made *Leucæna glauca* a favorite garden plant in many warm countries where its vigorous constitution, the ability of its seeds to germinate under trying conditions, and its rapid growth have enabled it to secure a foothold and gradually spread itself over wide areas.

[1] Hemsley, *Bot. Biol. Am. Cent.* i. 351.

[2] Bentham, *Martius Fl. Brasil.* xv. pt. ii. 391.

[3] Grisebach, *Fl. Brit. W. Ind.* 220. — Sauvalle, *Fl. Cub.* 35.

[4] Chapman, *Fl.* ed. 2, Suppl. 619.

[5] Oliver, *Fl. Trop. Afr.* ii. 337.

[6] Wight & Arnott, *Prodr. Fl. Ind.* 276. — Bentham, *Fl. Hongk.* 100. — Hooker f. *Fl. Brit. Ind.* ii. 290.

[7] Hillebrand, *Fl. Haw. Is.* 114.

[8] *Acaciæ similis Americana non spinosa, floribus globosis albis ramosis*, 3.

Acacia, Buxi foliis rotundioribus, floribus albis, siliqua lata compressa, Catesby, *Nat. Hist Car.* ii. 42, t. 42.

Mimosa arborescens Americana non spinosa, pinnis Acaciæ latioribus inferne glaucis, flore albo, Breyn, *Prodr.* ed. 1739, 83.

Mimosa inermis, foliis duplicato-pinnatis: partialibus utrinque senis pluribusve, siliquis planis membranaceis, Royen, *Fl. Leyd. Prodr.* 472.

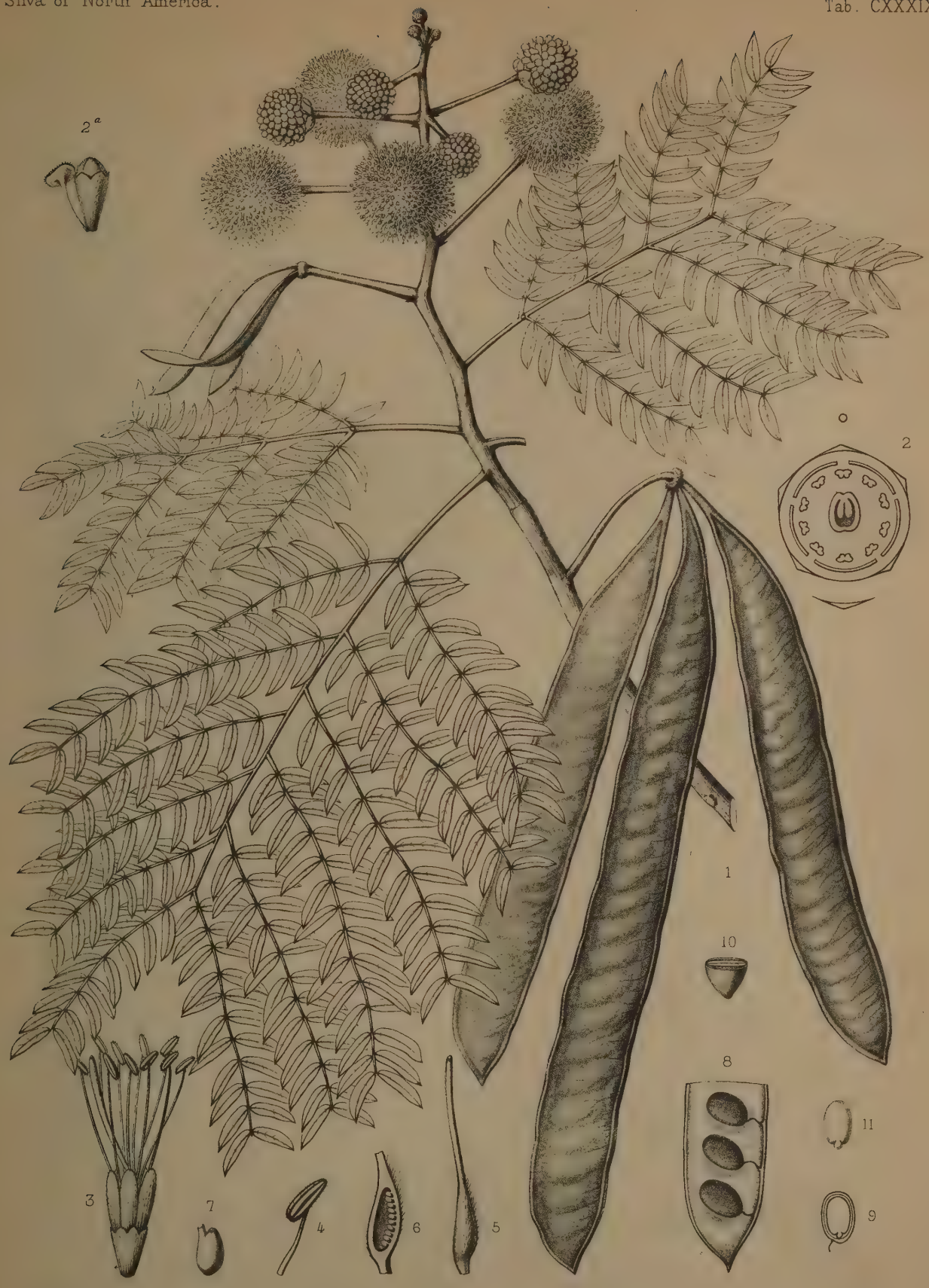
Acacia non spinosa, flore albo, foliorum pinnis latiusculis glabris, siliquis longis planis, Miller, *Dict. Icon.* 4, t. 4. — Trew, *Pl. Ehret*, 9, t. 36.

[9] Aiton, *Hort. Kew.* iii. 441. — Loudon, *Arb. Brit.* ii. 665.

EXPLANATION OF THE PLATE.

Plate CXXXIX. Leucæna glauca.

1. A flowering branch, natural size.
2. Diagram of a flower.
2a. A flower-bud with its bractlet, enlarged.
3. A flower, enlarged.
4. A stamen, enlarged.
5. A pistil, enlarged.
6. Vertical section of an ovary, enlarged.
7. An ovule, much magnified.
8. A portion of a legume, one of the valves removed, natural size.
9. Vertical section of a seed, natural size.
10. Cross section of a seed, enlarged.
11. An embryo, magnified.



C. E. Faxon del. Picart fr. sc.

LEUCÆNA GLAUCA, Benth.

A. Riocreux direx.t Imp. R. Tancur, Paris

LEUCÆNA PULVERULENTA.

Mimosa.

Branchlets pulverulent-tomentose. Peduncle ebracteolate. Leaves 30 to 36-pinnate, the pinnæ 60 to 120-foliolate.

Leucæna pulverulenta, Bentham, *Hooker Lond. Jour. Bot.* iv. 417; *Trans. Linn. Soc.* xxx. 443 (*Rev. Mim.*). — Dietrich, *Syn.* v. 477. — Hemsley, *Bot. Biol. Am. Cent.* i. 351. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 63; *Garden and Forest*, ii. 388, f. 122. — C. G. Pringle, *Garden and Forest*, ii. 393. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 98 (*Man. Pl. W. Texas*).

Acacia pulverulenta, Schlechtendal, *Linnæa*, xii. 571.

Acacia æsculenta, Martens & Galeotti, *Bull. Acad. Brux.* x. pt. ii. 312.

A tree, fifty or sixty feet in height, with a straight trunk eighteen or twenty inches in diameter, separating, twenty or thirty feet from the ground, into slender spreading branches which form a loose round handsome head. The bark of the trunk is a quarter of an inch thick, bright cinnamon-brown, and roughened with thick persistent scales. The branchlets when they first appear are more or less striately grooved, and are thickly coated with pulverulent tomentum which, however, soon disappears, and at the end of a few weeks they become terete, pale cinnamon-brown, and only slightly puberulous. The leaves are from four to seven inches long and three or four inches broad, with fifteen to eighteen pairs of pinnæ, slender petioles usually marked with a large dark oblong gland between the somewhat enlarged base and the lowest pair of pinnæ, and minute caducous stipules. When the leaves unfold they are covered, like the peduncles and flower-buds, with dense hoary tomentum, and at maturity are puberulous on the petioles and rachises. The leaflets are linear, acute at the apex, rather oblique at the base by the greater development of the upper side, sessile or very short-petiolulate, pale bright green, and from a sixth to a quarter of an inch in length. The flower-heads, which are half an inch or rather more in diameter, appear in succession, as the branches grow, from early spring to midsummer, and are borne on slender peduncles an inch or an inch and a half in length fascicled in the axils of the upper leaves of the branchlets, which, when the tree is in flower, thus appear to terminate in leafy racemes one or two feet long. The flowers are produced from the axils of minute clavate scarious bractlets. The calyx is slightly five-toothed and a quarter as long as the acute petals, which, like these, are pilose on the outer surface. The stamens are twice the length of the petals, with glabrous oblong anthers. The ovary is coated with long pale hairs. The legumes, which are of different lengths and produced two or three together on a common peduncle thickened at the apex, are conspicuously thick-margined, four to fourteen inches in length, long-stalked, and tipped with short straight or recurved points. The seeds are five sixteenths of an inch long with a dark lustrous coat.

Leucæna pulverulenta grows in Texas for a few miles along the Rio Grande near its mouth; it is more abundant from Matamoras to Monterey in Nuevo Leon, and has also been collected in Mexico on the banks of the Misantla River near San Antonio, at Orizaba and Cordova and near the City of Mexico. In the valley of the lower Rio Grande *Leucæna pulverulenta* is not common, being found only in a few places on the banks of the river or on the borders of lagoons and small streams, always growing in rich moist soil, and usually associated with the beautiful Texas Elm, which hardly overtops it.

The wood of *Leucæna pulverulenta* is heavy, hard, and very close-grained, and contains numerous thin conspicuous medullary rays, and many small regularly distributed open ducts. It is rich dark brown, with thin clear yellow sapwood composed of two or three layers of annual growth. The specific gravity of the absolutely dry wood is 0.6732, a cubic foot weighing 41.95 pounds. It is considered

more valuable than the wood of any other tree of the lower Rio Grande valley, and is sometimes manufactured into lumber, although the large trunks are often hollow or defective.

Leucæna pulverulenta was discovered by Jean Louis Berlandier[1] in Nuevo Leon in 1830. It is the most beautiful of the Mimosa-like trees which grow naturally within the territory of the United States, and has occasionally been planted for shade and ornament in the towns of the lower Rio Grande valley, which it decorates with its handsome trunks, graceful feathery foliage, and abundant flowers. In cultivation it grows with great rapidity;[2] and it may be expected to flourish in southern Europe, where it was introduced in 1889 through the Arnold Arboretum, in southern California, and other warm countries.

[1] See i. 82.

[2] In Matamoras trees believed to have been planted not more than twenty-five years ago are thirty or forty feet high, with fine spreading tops.

EXPLANATION OF THE PLATE.

PLATE CXL. LEUCÆNA PULVERULENTA.

1. A flowering branch, natural size.
2. A portion of a head of flowers, slightly enlarged.
3. A flower with its bractlet, enlarged.
4. A pistil, enlarged.
5. Vertical section of an ovary, enlarged.
6. A cluster of legumes, natural size.
7. A portion of a legume, one of the valves removed, natural size.
8. Vertical section of a seed, enlarged.
9. An embryo, magnified.

C.E. Faxon del. Picart fr. sc.

LEUCÆNA PULVERULENTA, Benth.

A. Riocreux dirext Imp. R. Taneur, Paris.

ACACIA.

FLOWERS perfect or polygamous, in globose heads or cylindrical spikes; calyx 4 or 5, rarely 3-parted, the divisions valvate in æstivation, or sometimes almost wanting; petals as many as the divisions of the calyx, valvate in æstivation; stamens indefinite, free or slightly connected at the base; ovary 2 or many-ovuled. Legume 2-valved or indehiscent. Leaves bipinnate.

Acacia, Adanson, *Fam. Pl.* ii. 319. — Meisner, *Gen.* 96. — Endlicher, *Gen.* 1326.— Bentham & Hooker, *Gen.* i. 594.— Baillon, *Hist. Pl.* ii. 68.
Vachellia, Wight & Arnott, *Prodr. Fl. Ind.* 272. — Meisner, *Gen.* 96. — Endlicher, *Gen.* 1326.
Aldina, E. Meyer, *Comm. Pl. Afr.* i. 171 (not Adanson nor Endlicher).
Farnesia, Gasparini, *Descr. Nuov. Gen. Leg.*
Tetracheilos, Lehmann, *Pl. Preiss.* ii. 368.
Chithonanthus, Lehmann, *Pl. Preiss.* ii. 368.
Arthrosprion, Hasskarl, *Retzia*, i. 212.

Trees, shrubs, or occasionally herbs, with unarmed aculeate or spinescent branches. Leaves bipinnate; leaflets usually small, in many pairs; or reduced to simple phyllodia or dilated petioles; stipules spinescent or inconspicuous, rarely membranaceous. Peduncles axillary, solitary, or fascicled, or panicled at the ends of the branches, generally furnished, either at the apex, towards the middle, or near the base, with two short connate scale-like bracts. Flowers perfect or often polygamous, in globose heads or cylindrical spikes, small, generally yellow or greenish white, in the axils of minute linear bractlets more or less dilated and often peltate at the apex. Calyx campanulate, dentate, lobed or divided into distinct sepals sometimes reduced to minute hairs. Petals more or less united, rarely free, very rarely wanting. Stamens numerous, usually more than fifty, exserted, free or slightly and irregularly united at the base, inserted under or just above the base of the ovary; filaments filiform; anthers small, attached on the back, versatile, introrse, two-celled, the cells opening longitudinally; pollen grains generally aggregated into two to four masses in each cell. Ovary sessile or stipitate, two or many-ovuled, contracted into a long slender style terminating in a minute stigma; ovules suspended from the inner angle of the ovary, two-ranked, superposed, anatropous, the micropyle superior. Legume ovate, oblong or linear, straight, falcate or variously twisted, flat or nearly cylindrical, membranaceous, coriaceous or woody, two-valved or indehiscent, continuous or variously divided within, very rarely separating into one-seeded joints. Seed transverse or longitudinal, usually ovate, compressed, destitute of albumen; funicle filiform or thick, colored, straight or twice or thrice folded upon itself, sometimes entirely surrounding the seed, often dilated at the apex into a more or less flat aril; testa thick, crustaceous, generally marked on the centre of each face of the seed with an oval or horseshoe-shaped depression or opaque spot or ring sometimes very obscure. Embryo filling the cavity of the seed; cotyledons oval, flat, the radicle straight, included, slightly exserted.

Acacia is generally distributed through the warmer parts of the world, especially in regions of scanty rainfall, and seems to have abounded in Europe towards the end of the Lower Eocene period.[1] No less than four hundred and thirty-two species are now distinguished.[2] Australia, the headquarters of the genus, contains nearly three hundred species;[3] they abound in tropical[4] and southern Africa[5] and in northern Africa and the Orient,[6] in all the warmer regions of southern Asia,[7] in the islands of

[1] Saporta, *Origine Paléontologique des Arbres*, 320.
[2] Bentham, *Trans. Linn. Soc.* xxx. 444 (*Rev. Mim.*).
[3] Bentham, *Fl. Austral.* ii. 301.
[4] Oliver, *Fl. Trop. Afr.* ii. 337.
[5] Harvey & Sonder, *Fl. Cap.* ii. 279.
[6] Boissier, *Fl. Orient.* ii. 635.
[7] Thwaites, *Enum. Pl. Zeylan.* 99. — Hooker f. *Fl. Brit. Ind.* ii. 292. — Hemsley, *Jour. Linn. Soc.* xxiii. 215.

the south Pacific,[1] in tropical and subtropical America,[2] in the West Indies,[3] Central America, and Mexico,[4] and the desert regions adjoining the southern boundary of the United States, where eleven or twelve species occur.[5] Three of these are small trees; the others are large or small shrubs.[6]

Acacia is astringent, and many species, especially those of Australia, yield valuable tan-barks.[7] Gum arabic[8] is produced by different species of African, Indian, and Australian Acacias, principally by *Acacia Senegal*,[9] *Acacia Arabica*,[10] *Acacia stenocarpa*,[11] *Acacia Seyal*,[12] *Acacia horrida*,[13] and the Australian *A. pycnantha*.[14] Catechu or cutch,[15] an astringent medicine, is obtained from the wood of the Indian *Acacia Catechu*[16] and of *Acacia Suma*.[17] Acacia yields hard heavy and durable wood, and some of the Australian species are large and valuable timber-trees.[18] Many Acacias bear beautiful graceful foliage and handsome fragrant flowers, and several Australian species are now cultivated in the gardens of all semitropical countries and in northern conservatories.[19]

The genus was established by Tournefort[20] and was afterwards adopted by Adanson. The generic name, from ἀχαχία, relates to the spines with which the branches are usually armed.

[1] Gray, *Bot. Wilkes Explor. Exped.* i. 480. — Seemann, *Fl. Vit.* 73. — Hillebrand, *Fl. Haw. Is.* 112.

[2] Bentham, *Martius Fl. Brasil.* xv. pt. ii. 391.

[3] Grisebach, *Fl. Brit. W. Ind.* 220.

[4] Hemsley, *Bot. Biol. Am. Cent.* i. 352.

[5] Brewer & Watson, *Bot. Cal.* i. 163. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 99 (*Man. Pl. W. Texas*).

[6] Of the five great series in which Bentham arranged the species of Acacia, the *Phyllodineæ*, with leaves reduced to simple phyllodia, are almost exclusively confined to Australia, where Acacia is represented by a larger number of species than any other genus of flowering plants. The other series with bipinnate leaves are cosmopolitan in the warmer parts of the world, especially in the tropics.

[7] Maiden, *Useful Native Plants of Australia*, 302.

[8] Flückiger & Hanbury, *Pharmacographia*, 206.

[9] Willdenow, *Spec.* iv. 1077. — Oliver, *Fl. Trop. Afr.* ii. 340. — Bentham, *Trans. Linn. Soc.* xxx. 516 (*Rev. Mim.*).

[10] Willdenow, *l. c.* 1058. — Oliver, *l. c.* 350. — Bentham, *l. c.* 506. — Hooker f. *Fl. Brit. Ind.* ii. 293.

This tree, which is one of the most valuable of the genus, is widely distributed in all the Upper Nile region, and extends through Afghanistan to the Indian peninsula, where it has also been largely cultivated and naturalized except in the humid coast regions. The gum, which exudes in large quantities from wounds made in the bark, is used in India for native medicines, and by dyers and cloth-printers, and is largely exported. The wood is tough and durable, and is much employed in the manufacture of agricultural implements, for the hubs and fellies of wheels, and in boat-building. The bark is used for tanning and dyeing, and in India domestic animals are fed on the shoots and the unripe pods. Lakh is produced in some Indian provinces in large quantities from the small dried branches. (Brandis, *Forest Fl. Brit. Ind.* 181.)

[11] Richard, *Fl. Abyss.* i. 238. — Oliver, *l. c.* 351. — Bentham, *l. c.* 512.

[12] Delile, *Fl. d'Égypte*, 142, t. 52, f. 2. — Oliver, *l. c.* 351. — Bentham, *l. c.* 512.

[13] Willdenow, *l. c.* 1082. — Harvey & Sonder, *Fl. Cap.* ii. 281. — Bentham, *l. c.* 507.

[14] Bentham, *Hooker Lond. Jour. Bot.* i. 351; *Fl. Austral.* ii. 365; *Trans. Linn. Soc.* xxx. 469.

[15] Flückiger & Hanbury, *l. c.* 213.

[16] Willdenow, *l. c.* 1079. — Bentham, *Trans. Linn. Soc.* xxx. 519. — Hooker f. *l. c.* 295.

The wood of *Acacia Catechu* is exceedingly durable, and is not attacked by white ants or injured by the Teredo. In India it is thought to yield the best charcoal, and in some parts of the country is largely used in the manufacture of agricultural implements, while in Burmah it is said to be preferred to all other woods for house-posts. The bark is astringent and bitter, and is sometimes employed in tanning. The most valuable product of this tree, however, is catechu. In order to prepare this the heartwood is cut into chips which are boiled in water many times changed until it is reduced to a thick black paste, which when dry is the cutch of commerce. This is consumed in the East with the betel-leaf, is exported to Europe for dyeing and tanning, and is also used medicinally. (Brandis, *l. c.* 187.)

[17] Brandis, *l. c.* 187. — Bentham, *l. c.* 519.

[18] Maiden, *l. c.* 349.

Acacia Melanoxylon (Aiton, *Hort. Kew.* ed. 2, v. 462. — Bentham, *Fl. Austral.* ii. 388; *Trans. Linn. Soc.* xxx. 481), the Australian Black-wood, a large tree of extratropical and semitropical eastern Australia, is perhaps the most valuable of the genus as a timber-tree, producing hard and close-grained very dark-colored durable wood capable of receiving a fine polish. It is much used in cabinet-making, in boat-building, for gun-stocks, picture-frames, pianofortes, and oil-casks, and in all sorts of construction. *Acacia Melanoxylon* has been extensively cultivated in Madras and other parts of India, although it has not maintained its Australian reputation there as a timber-tree. (Maiden, *l. c.*)

[19] Nicholson, *Dict. Gard.* — Naudin, *Manuel de l'Acclimateur*, 107.

[20] Tournefort, *Inst.* 605, t. 375.

CONSPECTUS OF THE NORTH AMERICAN SPECIES.

Flowers in globose heads, the peduncles bibracteolate at the apex; legume thick, pulpy, indehiscent . . . . . 1. A. Farnesiana.

Flowers in elongated slender spikes; legume compressed, straight or contracted between the seeds; branches armed with stout recurved infrastipular spines.

Legume broad, straight or slightly contracted between the seeds; seeds narrowly obovate or ovate . . . . . 2. A. Wrightii.

Legume narrow, often conspicuously contracted between the seeds; seeds nearly orbicular 3. A. Greggii.

ACACIA FARNESIANA.

Huisache. Cassie.

FLOWERS in globose heads on clustered peduncles bibracteolate at the apex. Legume thick, pulpy, indehiscent. Branchlets armed with persistent spinescent stipules.

Acacia Farnesiana, Willdenow, *Spec.* iv. 1083. — Nuttall, *Gen.* ii. 80. — De Candolle, *Prodr.* ii. 461. — Don, *Gen. Syst.* ii. 414. — Spach, *Hist. Vég.* i. 80. — Hooker, *Compan. Bot. Mag.* i. 24. — Bentham, *Hooker Lond. Jour. Bot.* i. 494; *Trans. Linn. Soc.* xxx. 502 (*Rev. Mim.*). — Dietrich, *Syn.* v. 494. — Engelmann & Gray, *Jour. Bost. Soc. Nat. Hist.* v. 216, 239 (*Pl. Lindheim.* i.). — Seemann, *Bot. Voy. Herald*, 282. — Gray, *Smithsonian Contrib.* iii. 67 (*Pl. Wright.* i.); *Proc. Am. Acad.* v. 158. — Torrey, *Bot. Mex. Bound. Surv.* 62. — Chapman, *Fl.* ed. 2, Suppl. 619. — Sargent, *Garden and Forest*, ii. 400. — Coulter, *Contrib. U. S. Nat. Herb.* 99 (*Man. Pl. W. Texas*).

Mimosa Farnesiana, Linnæus, *Spec.* 521. — Lamarck, *Dict.* i. 18. — *Nouveau Duhamel*, ii. 92, t. 28.

Mimosa scorpioides, Forskål, *Fl. Ægypt.-Arab.* lxxvii.

A. pedunculata, Willdenow, *Spec.* iv. 1084.

A. edulis, Willdenow, *Enum.* 1056.

Mimosa pedunculata, Poiret, *Lam. Dict.* Suppl. i. 81.

Vachellia Farnesiana, Wight, *Cat.* No. 591; *Icon. Pl. Ind. Orient.* t. 300. — Wight & Arnott, *Prodr. Fl. Ind.* 272.

Farnesia odora, Gasparini, *Descr. Nuov. Gen. Leg.* t.

A.? leptophylla, De Candolle, *Cat. Hort. Monsp.* 74; *Prodr.* ii. 472.

A. Farnesiana, var. pedunculata, Don, *Gen. Syst.* ii. 414.

A. lenticellata, F. Mueller, *Jour. Linn. Soc.* iii. 147.

A tree, twenty or thirty feet in height, with a straight trunk twelve or eighteen inches in diameter, separating, six or eight feet from the ground, into many long pendulous graceful branches which form a round wide-spreading head. The bark of the trunk, which is thin and reddish brown, is irregularly broken by long reticulated ridges, and exfoliates in large thin scales. The branchlets are slender, terete, or slightly striately angled, glabrous or at first puberulous, and armed with straight rigid terete spines developed from the persistent stipules and sometimes an inch and a half long, often much smaller or minute. The leaves are alternate on the young branchlets and are fascicled in earlier axils; they are short-petiolate with from two to eight but usually four or five pairs of pinnæ, three or four inches in length, and generally somewhat puberulous on the petioles and rachises, and in Texas mostly fall at the beginning of winter; the pinnæ are sessile or short-stalked, remote or close together, and from twenty to fifty-foliolate. The leaflets are linear, acute, tipped with minute points, unequal at the base, sessile or short-petiolulate, glabrous or puberulous, and bright green on both surfaces. The peduncles are axillary, solitary, or most often two or three together; they are rather slender, puberulous, from an inch to an inch and a half long, and furnished with two minute dentate connate bracts which form an involucral cup immediately under the flower-heads. These are covered with hoary pubescence before the flowers open, and at maturity are two thirds of an inch in diameter. The flowers are bright yellow, very fragrant, a sixteenth of an inch in length, and are produced during the summer and autumn from the axils of minute clavate pilose bractlets. The calyx is about half as long as the petals, and like them somewhat pilose on the outer surface. The stamens are two or three times as long as the corolla. The ovary is shortly stipitate and covered with long pale hairs. The legumes are indehiscent, oblong, cylindrical or spindle-shaped, thick, turgid, straight or curved, slightly constricted between the seeds, short-stalked, and contracted at the apex into short thick points; they are two or three inches long, one half to two thirds of an inch broad, dark red-purple, lustrous, and marked by broad light-colored bands along the two sutures which are defined by elevated grooved lines. The outer coat of the walls is thin and papery, and incloses a thick pithy pulp-like substance which surrounds the seeds, each in a

separate thin-walled compartment. The seeds are suspended transversely in two ranks on short straight funicles; they are a quarter of an inch long, ovate, thick, and flattened on the inner surface by mutual pressure; the testa is crustaceous, and consists of a thin outer and of a thicker harder and paler inner coat; it is light brown and lustrous on the outer surface, which is faintly marked on both sides of the seed by large oval rings. The embryo is pale yellow, with thick cotyledons, and has a straight slightly exserted radicle.

Acacia Farnesiana is now widely distributed through the tropical and subtropical regions of the two worlds; it has, however, been so long cultivated and has established itself so completely in many countries that it is not possible to determine accurately where it is really indigenous. It is probably a native of America from the valley of the Rio Grande to northern Chile;[1] it is abundant and probably indigenous in northern central and in the interior of northeastern Australia;[2] it is abundant, too, and possibly indigenous in south-tropical Africa,[3] and has become entirely naturalized in the West Indies,[4] in Guiana, Brazil,[5] and in some parts of the Argentine Republic, in northern[6] and northern-tropical Africa,[7] India,[8] southern China,[9] the Indian Archipelago,[10] and the islands of the Pacific Ocean.[11] Along the southern borders of the United States *Acacia Farnesiana* is established in the neighborhood of towns from the shores of the Gulf of Mexico[12] to southern California,[13] and in the arid and almost uninhabited region between the Nueces and the Rio Grande it grows in places so remote from human habitations and apparently so little altered through the agency of man that it is not easy to believe that it is not indigenous there. In southern Florida on the shores of the Gulf of Mexico, and in the neighborhood of New Orleans, *Acacia Farnesiana* has also sparingly established itself as an escape from gardens.

The wood of *Acacia Farnesiana* is hard, heavy, and close-grained; it contains many evenly distributed open ducts, the layers of annual growth being barely distinguishable, and many thin conspicuous medullary rays, and is a rich reddish brown, with thin pale sapwood. The specific gravity of the absolutely dry wood is 0.8304, a cubic foot weighing 51.74 pounds.[14] In India it is used for the knees of small vessels and in the manufacture of agricultural implements;[15] and a gum of commercial value is collected from the trunk.[16] A decoction of the pods, which contain a large amount of tannin, is used in Mexico in making ink.[17]

Acacia Farnesiana is cultivated on a large scale in southern Europe, especially in France and northern Italy, for its fragrant flowers which are used in the manufacture of perfumery;[18] it is planted for ornament in the gardens of all warm countries, and in India is employed as a hedge plant.

[1] A. de Candolle, *Géographie Botanique*, ii. 770. — Bentham, *Trans. Linn. Soc.* xxx. 502 (*Rev. Mim.*).

[2] Bentham, *Fl. Austral.* ii. 419.

[3] Bentham, *Trans. Linn. Soc. l. c.*

[4] Grisebach, *Fl. Brit. W. Ind.* 222. — Eggers, *Bull. U. S. Nat. Mus.* No. 13, 49.

[5] Bentham, *Martius Fl. Brasil.* xv. pt. ii. 394.

[6] Hooker, *Niger Fl.* 331. — Oliver, *Fl. Trop. Afr.* ii. 346.

[7] Ball, *Jour. Linn. Soc.* xvi. 442.

[8] Wight & Arnott, *Prodr. Fl. Ind.* 272 (Vachellia). — Beddome, *Fl. Sylv. S. Ind.* i. t. 52. — Hooker f. *Fl. Brit. Ind.* ii. 292.

[9] Bentham, *Fl. Hongk.* 101.

[10] Miquel, *Fl. Ind. Bat.* i. pt. i. 7.

[11] Hillebrand, *Fl. Haw. Is.* 113.

[12] Hemsley, *Bot. Biol. Am. Cent.* i. 352. — Havard, *Proc. Nat. Mus.* viii. 499. — C. G. Pringle, *Garden and Forest*, ii. 393.

[13] Brewer & Watson, *Bot. Cal.* i. 164.

[14] *Garden and Forest*, iii. 344.

[15] Beddome, *l. c.*

[16] Gamble, *Man. Indian Timbers*, 150.

[17] Havard, *l. c.*

[18] Grasse in southern France is the centre of Cassie culture in Europe. A sandy soil and the warm slopes of hills open to the sun and protected from cold north winds are preferred for the plantations, which are often of great extent. On limestone soil the Cassie also flourishes and grows to a larger size than on granite, but it blossoms later, and flowers which open late in the season are less fragrant than earlier ones.

The seed is sown in March and April in carefully prepared beds exposed to the south and frequently watered to hasten germination and the growth of the young plants. These are transplanted the following year to the ground where they are to stand permanently, and are usually set six feet apart each way in order to secure a sufficient development of the branches and permit the cultivation of the soil between the plants. The plantations are kept free from weeds, and the ground is usually thoroughly cultivated every spring and enriched with a good coating of manure. The main stems of the young plants are generally stopped at a height of two feet from the ground to force the development of several main branches,

Acacia Farnesiana appears to have been first cultivated in Europe in the gardens of Cardinal Odoardo Farnese[1] in Rome, whither it was brought in 1611 from San Domingo; and the earliest description with an excellent figure was published in 1625 by Pietro Castelli in a work[2] devoted to an account of the rare plants in the Farnese gardens.[3]

so that the flowers, which are gathered by women and children, may not grow too far above the ground. The branches are cut every year in such a manner as to give the plants a vase-like form, which has been found best suited to insure the production of the largest quantity of flowers near the ground. The flowers are produced from the middle of summer until the middle of autumn, and a few blossoms continue to appear until frost. The earliest, however, those which open during hot weather, are considered more valuable than those which open late in the season, and every effort is made to advance the flowering period. The flowers are gathered in the morning and are at once delivered to manufacturers.

A variety known as *Acacia Farnesiana sempervirens*, which appeared a few years ago in the gardens of southern Europe, is now cultivated. It is thought to be more valuable than the ordinary form, as it produces two crops of flowers in a year, one in the spring and the other at the end of summer. It is also a larger, more robust, hardier, and more productive plant than the type. The essence of cassie is used in the preparation of pomades, perfumed oils, and extracts. The flowers are not distilled, the only process used to extract the perfume being that known as *enfleurage*. This consists in spreading the flowers over glass plates covered with a thin layer of pure grease. The grease is turned over two or three times a week until it is impregnated with the perfume, usually at the end of twenty-five or thirty days. The impregnated grease is then distilled to obtain the pure essence. The process of *enfleurage* is also performed with hot oil. Olive oil of the best quality is poured into large heated kettles containing the flowers, and is then heated almost or quite to the boiling point, while workmen keep turning the flowers with large wooden spoons to prevent them from falling to the bottom of the kettle and burning. When this operation has been continued long enough, the flowers and oil are poured into little sacks which are then pressed under an hydraulic press. (See Naudin, *Garden and Forest*, iv. 309. — Eugene Rimmel, *The Book of Perfumes*, 228, 251. — *The Art of Perfumery*, by G. W. Septimus Piesse, 26, 199.)

[1] Odoardo Farnese (1573–1626) was distinguished for the sanctity of his life, and for his wealth and the magnificence of his palaces and gardens. (See Litta, *Famiglie Celebri di Italia.*)

[2] *Exactissima Descriptio Rariorum Quarundam Plantarum, quæ continentur Romæ in Horto Farnesiano.*

[3] *Acacia Indica Farnesiana*, 3, t. — Ray, *Hist. Pl.* i. 977.

Acacia Indica foliis Scorpioides leguminosæ siliquis fuscis teretibus resinosis, Hermann, *Cat. Hort. Lugd. Bat.* 5. — Miller, *Dict.* No. 4.

Mimosa spinis geminis distinctis, foliis duplicato pinnatis, partialibus utrinque octo, Linnæus, *Hort. Ups.* 146.

EXPLANATION OF THE PLATE.

Plate CXLI. Acacia Farnesiana.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. Vertical section of an ovary, enlarged.
5. A fruiting branch, natural size.
6. Cross section of a legume, natural size.
7. Vertical section of a portion of a legume, natural size.
8. Vertical section of a seed, enlarged.
9. An embryo, enlarged.

C.E. Faxon del. Picart fr. sc.

ACACIA FARNESIANA, Willd.

A Riocreux direx.t Imp. R. Taneur, Paris.

ACACIA WRIGHTII.

Cat's Claw.

LEGUMES broad, straight, or somewhat contracted between the seeds; seeds narrowly obovate or ovate. Leaves glabrous or slightly pubescent.

Acacia Wrightii, Bentham; Gray, *Smithsonian Contrib.* iii. 64 (*Pl. Wright.* i.); *Trans. Linn. Soc.* xxx. 521 (*Rev. Mim.*). — Gray, *Smithsonian Contrib.* v. 53 (*Pl. Wright.* ii.). — Walpers, *Ann.* iv. 626. — Torrey, *Bot. Mex. Bound. Surv.* 61. — Watson, *Proc. Am. Acad.* xvii. 351. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 63.

A small tree, occasionally twenty-five to thirty feet in height, with a short trunk ten or twelve inches in diameter and spreading branches forming a low wide irregular head; or more frequently a shrub with many stems often only a few feet high. The bark of the trunk is an eighth of an inch thick and furrowed, the surface of the ridges separating into thin narrow scales. The branches are armed with occasional stout recurved infrastipular chestnut-brown spines a quarter of an inch long, compressed towards the broad base and very sharp-pointed, or are rarely unarmed. The branchlets when they first appear are somewhat striately angled, glabrous, and pale yellow-brown or dark red-brown, turning pale gray in their second year. The leaves are alternate on the young branchlets or fascicled in the axils of former leaves, glabrous or slightly pubescent especially on the petioles and rachises, with two to six pinnæ, and one or two inches in length. The petioles are slender, a third of an inch long, and eglandular or furnished with small convex glands; the pinnæ are four to ten-foliolate. The leaflets are obliquely obovate-oblong, obtuse, rounded and often apiculate, sessile or short-petiolulate, two or sometimes three-nerved, reticulate-veined, rigid, bright green and rather paler on the lower than on the upper surface, and from a sixteenth to a quarter of an inch long. The stipules are linear, acute, a sixteenth of an inch in length, and caducous. The flowers, which appear from the end of March to the end of May, are produced in narrow spikes an inch and a half long, often interrupted below the middle, on slender fascicled axillary pubescent or sometimes glabrous peduncles; they are borne on thin pubescent pedicels from the axils of minute caducous bractlets, and are light yellow and fragrant, with stamens a quarter of an inch in length. The calyx is obscurely five-lobed, pubescent on the outer surface, and half as long as the spatulate petals, which are slightly united at the base and ciliate on the margins. The ovary is long-stalked and clothed with long pale hairs. The legumes, which are fully grown early in the summer and fall in the autumn, are indehiscent, slightly falcate, compressed, stipitate, oblique at the base, rounded and short-pointed at the apex, two to four inches in length, an inch in breadth, with thick straight or irregularly contracted margins and thin papery walls conspicuously marked by narrow horizontal reticulated veins. The seeds, which are suspended transversely on long slender funicles, are narrowly obovate, compressed, and a quarter of an inch long; the testa is thin, cartilaginous, light brown, and marked on the two sides of the seed with a large oval depression. The embryo is compressed, with oval cotyledons and an included radicle.

Acacia Wrightii is distributed from the neighborhood of New Braunfels in the valley of the Guadaloupe River in western Texas to the Sierra Madre in Nuevo Leon. It is most common and grows to the largest size south of the Rio Grande, where it abounds on dry gravelly mesas and foothills.

The wood of *Acacia Wrightii* is very heavy, hard, and close-grained, with the layers of annual growth marked by one or two rows of small open ducts, and contains many smaller scattered open ducts and obscure medullary rays. The color is a bright clear brown streaked with red and yellow, the thin

sapwood composed of six or seven layers of annual growth being clear yellow. The specific gravity of the absolutely dry wood is 0.9392, a cubic foot weighing 58.53 pounds. It furnishes excellent fuel, and is used in large quantities for that purpose in all the territory adjacent to the lower Rio Grande.

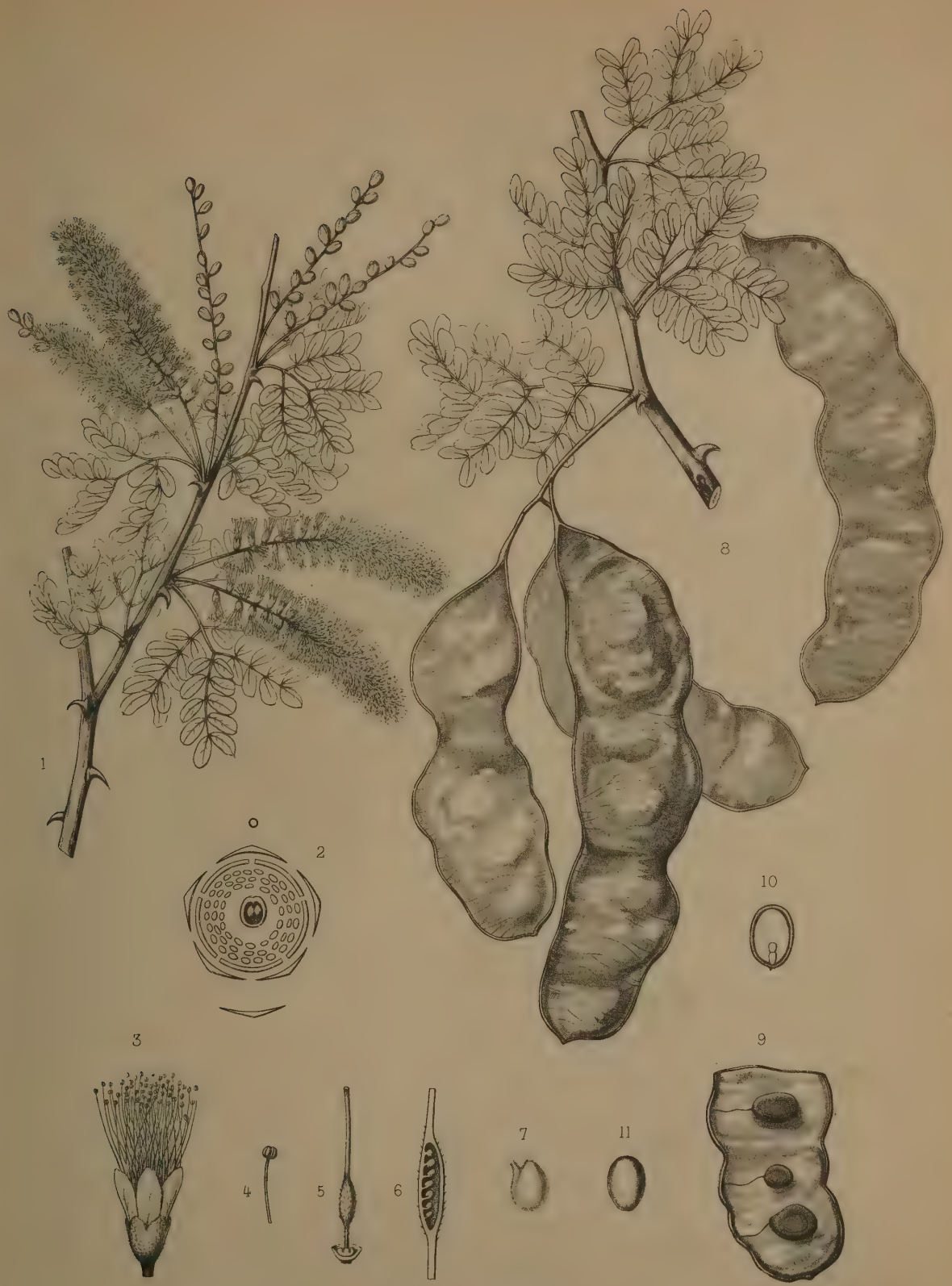
Acacia Wrightii was discovered in the neighborhood of Matamoras by Jean Louis Berlandier in 1830. Its specific name commemorates the late Charles Wright,[1] who, several years later, found it in western Texas.

[1] See i. 94.

EXPLANATION OF THE PLATE.

Plate CXLII. Acacia Wrightii.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Portion of a stamen, enlarged.
5. A pistil, enlarged.
6. Vertical section of an ovary, enlarged.
7. An ovule, much magnified.
8. A fruiting branch, natural size.
9. A portion of a legume, one of the valves removed, natural size.
10. Vertical section of a seed, enlarged.
11. An embryo, enlarged.



C. E. Faxon del. Picart fr. sc

ACACIA WRIGHTII, Benth

A Riocreux direx.t Imp. R Taneur, Par.

ACACIA GREGGII.

Cat's Claw. Uña de Gato.

LEGUMES narrow, often conspicuously contracted between the seeds; seeds nearly orbicular. Leaves hoary pubescent.

Acacia Greggii, Gray, *Smithsonian Contrib.* iii. 65; v. 53 (*Pl. Wright.* i., ii.); *Ives' Rep.* 11. — Torrey, *Sitgreaves' Rep.* 158. — Torrey, *Pacific R. R. Rep.* vii. pt. iii. 10; *Bot. Mex. Bound. Surv.* 61. — Walpers, *Ann.* iv. 625. — Bentham, *Trans. Linn. Soc.* xxx. 521 (*Rev. Mim.*). — Brewer & Watson, *Bot. Cal.* i. 164. — Rothrock, *Wheeler's Rep.* 108. — Hemsley, *Bot. Biol. Am. Cent.* i. 353.

A low many-branched tree, rarely thirty feet in height, with a trunk ten or twelve inches in diameter; or often a straggling shrub. The bark of the trunk is an eighth of an inch thick and furrowed, the surface separating into thin narrow scales. The branches are armed with stout recurved infrastipular terete spines a quarter of an inch long, and broad and flat at the base. The branchlets are striately angled, puberulous, and pale brown faintly tinged with red. The leaves are alternate on the young branchlets and fascicled in the axils of earlier leaves, pubescent or puberulous, with two to six pinnæ, one to three inches in length, persistent and petiolate, the short slender petioles being furnished near the middle with a minute oblong chestnut-brown gland; the pinnæ are eight to ten-foliolate, with oblique obovate hoary leaflets rounded or truncate at the apex, and unequally contracted at the base into short petiolules; they are two or three-nerved, reticulate-veined, from a sixteenth to a quarter of an inch long, and rather thick and rigid. The stipules are linear, acute, a sixteenth of an inch long, and caducous. The flowers, which appear in succession from April to September, are produced in dense oblong pubescent spikes from the axils of minute caducous bractlets; they are fragrant, bright creamy yellow, and with their stamens nearly a quarter of an inch long. The peduncles vary from one half to two thirds of an inch in length, and are fascicled usually two or three together in the axils of the leaves towards the ends of the branches. The calyx is obscurely five-lobed, puberulous on the outer surface, and half as long as the petals, which are only slightly united at the base and are bordered with a narrow margin of pale tomentum. The ovary is long-stalked and clothed with long pale hairs. The legumes, which are fully grown in midsummer, hang unopened on the branches until winter, and sometimes until the following spring; they are narrow, compressed, straight or slightly falcate, obliquely contracted at the base into a short stalk, and acute or rounded at the apex; they are more or less contracted between the seeds, and when fully ripe are curled or often contorted; the valves are thin and membranaceous, thick-margined, light brown, and conspicuously transversely reticulate-veined. The seeds are nearly orbicular, compressed, and a quarter of an inch in diameter; the testa is thin, crustaceous, dark brown and lustrous, and marked on the two sides of the seed with a small oval depression. The embryo is thin, with a short included radicle.[1]

Acacia Greggii is distributed from the valley of the Rio Grande in western Texas through southern

[1] *Acacia Greggii* often resembles *Acacia Wrightii* so closely that it is not easy to distinguish the two trees. Bentham described the Texas plant as unarmed, and depended chiefly upon this character to separate the two species. The branches of *Acacia Wrightii*, however, are armed, and it is unusual to find them without the short recurved spines which are similar on the two species. The leaflets of *Acacia Greggii* are rather smaller than those of *Acacia Wrightii*, and the foliage is a much lighter green and more generally pubescent. The pods are narrower and more conspicuously contracted between the seeds, and when fully ripe become twisted and contorted, a peculiarity I have never seen in the pods of *Acacia Wrightii*. The seeds, however, offer the best means for distinguishing the species. In *Acacia Wrightii* they are narrowly obovate or ovate, and in *Acacia Greggii* are constantly orbicular or nearly so, and much larger.

New Mexico and Arizona to southern California, and extends southward into northern Mexico. It is a common tree in all this region, occupying dry gravelly mesas, the sides of low cañons, and the banks of mountain streams.

The wood of *Acacia Greggii* is heavy, very hard, strong, close-grained, and durable. It contains several rows of large open ducts marking the layers of annual growth, and many thin medullary rays. It is rich brown or red, with thin light yellow sapwood composed of five or six layers of annual growth. The specific gravity of the absolutely dry wood is 0.8550, a cubic foot weighing 53.28 pounds.

A resinous gum resembling gum arabic is produced in small quantities by this species.[1]

Acacia Greggii was discovered in Nuevo Leon by Jean Louis Berlandier in 1830, and in Texas by Charles Wright in 1851. It was named in honor of Dr. Josiah Gregg, author of *The Commerce of the Prairies*, who made numerous early botanical explorations in Texas, New Mexico, and northern Mexico.

[1] *Am. Jour. Pharm.* lii. 409.

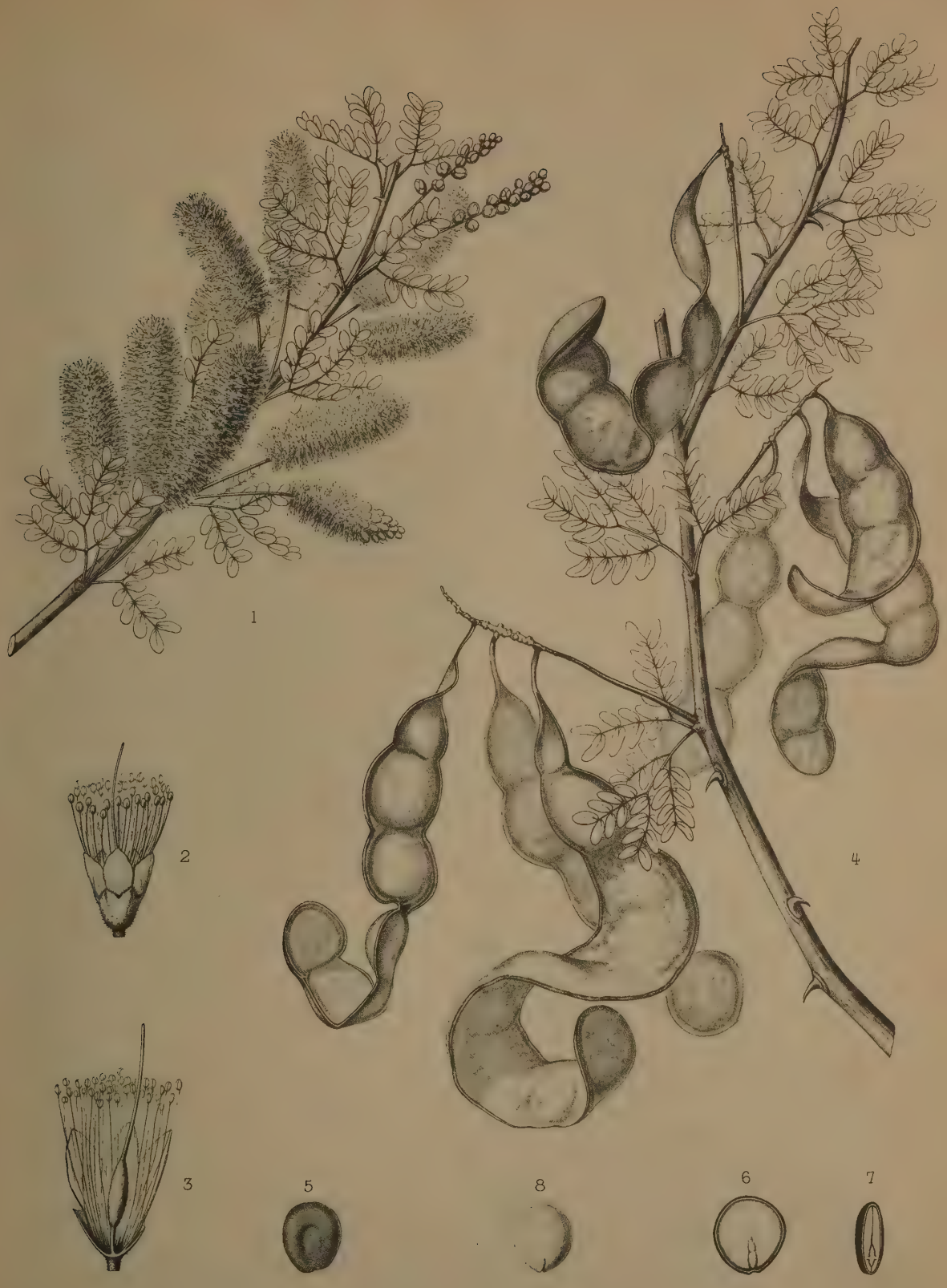
EXPLANATION OF THE PLATE.

PLATE CXLIII. ACACIA GREGGII.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. A fruiting branch, natural size.
5. A seed, enlarged.

6 and 7. Vertical sections of a seed, enlarged.

8. An embryo, enlarged.



C. E. Faxon del. Picart fr. sc.

ACACIA GREGGII, Gray.

A. Riocreux direx.t Imp. R. Taneur, Paris.

LYSILOMA.

FLOWERS perfect or polygamous, in globose heads or cylindrical spikes; calyx 5-toothed, the teeth valvate in æstivation; petals 5, valvate in æstivation; stamens indefinite, united at the base; ovary many-ovuled. Legume tardily dehiscent by the separation of the valves from the persistent margins. Leaves abruptly bipinnate.

Lysiloma, Bentham, *Hooker Lond. Jour. Bot.* iii. 82. — Bentham & Hooker, *Gen.* i. 595. — Baillon, *Hist. Pl.* ii. 70.

Trees or shrubs, with slender unarmed branches. Leaves bipinnate, long-petiolate, the petiole often marked by a large conspicuous gland; leaflets small, in many pairs, or sometimes large, in few pairs; stipules large, membranaceous, persistent, or deciduous. Flowers perfect or rarely polygamous, numerous, minute, usually white or greenish white, produced from the axils of minute bractlets more or less dilated at the apex, and collected into globose heads or cylindrical spikes. Peduncles axillary, solitary, or fascicled, or occasionally shortly racemose, and then developed from the axil of a deciduous bract, and furnished near the middle with a minute bractlet. Calyx campanulate, dentate. Corolla funnel-shaped, the petals united for more than half their length. Stamens indefinite, generally twelve to thirty, exserted; filaments filiform, united at the base into a column free from the corolla; anthers minute, ovate, attached on the back, versatile, two-celled, the cells opening longitudinally. Ovary free in the bottom of the calyx, sessile or shortly stipitate, many-ovuled, contracted into a slender subulate style; stigma terminal, minute; ovules suspended in two ranks from the inner angle of the ovary, superposed, anatropous, the micropyle superior. Legume linear or broad, straight or falcate, compressed, submembranaceous, the valves at maturity separating from the undivided margins or rarely dehiscent on the inner margin, continuous within; exocarp thin and papery, dark-colored; endocarp rather thicker, pale yellow. Seed ovate, compressed, destitute of albumen, transverse, suspended by a long slender funicle, the hilum near the base; testa thin, crustaceous. Embryo filling the cavity of the seed; cotyledons oval, flat; the radicle straight, slightly exserted.

Ten species[1] of Lysiloma, inhabitants of the West Indies, Mexico, Lower California,[2] Central America,[3] and Bolivia,[4] are distinguished. *Lysiloma latisiliqua*, a tree widely distributed through the Antilles, reaches the coast of southern Florida. Some of the species produce valuable timber, especially *Lysiloma Sabicu*,[5] a large tree of Cuba and the Bahama Islands.

The genus was established by Bentham to receive a number of plants previously referred to Acacia,

[1] Bentham, *Trans. Linn. Soc.* xxx. 533 (*Rev. Mim.*).

[2] Brandegee, *Proc. Cal. Acad.* ser. 2, ii. 153 (*Pl. Baja Cal.*).— Vasey & Rose, *Contrib. U. S. Nat. Herb.* No. 3, 69.

[3] Hemsley, *Bot. Biol. Am. Cent.* i. 356.

[4] *Lysiloma polyphylla*, Bentham, *l. c.* 535.

Acacia polyphylla, C. Gay, *Fl. Chil.* ii. 254.

[5] Bentham, *Hooker Jour. Bot. & Kew Gard. Misc.* vi. 236; *Trans. Linn. Soc. l. c.* 534.

Acacia formosa, Richard, *Fl. Cub.* ii. 205 (not Kunth).

Leucæna formosa, Grisebach, *Cat. Pl. Cub.* 82.

Sabicú or savicú, as the wood of this tree is called in Cuba and in commerce, is one of the most valuable of all tropical timbers. It is hard, heavy, strong, and close-grained, with only a thin layer of sapwood. The fibre, which is often twisted or curled, gives a wavy or figured appearance to the dark chestnut-colored surface, and has sometimes caused sabicú to be mistaken for rosewood. It seasons slowly without shrinking or splitting, and is very solid, although sometimes injured by cross fractures of the fibre in the interior of the logs. It is little affected by exposure to the weather, even when unprotected by paint or varnish. Sabicú was once largely employed in shipbuilding for beams, keelsons, stern-posts, pillars, and cleats; and is now much used, especially in England, by cabinet-makers, and for the treads of stairs. In the Bahamas, where *Lysiloma Sabicu* does not grow to so large a size as it does in Cuba, it is called Horseflesh Mahogany, and the wood is used in the islands in construction and for shipbuilding, and is exported to England in small quantities. (*Treasury of Botany*, ii. 704. — Laslett, *Timber and Timber-trees*, 164. — *Kew Bull.* i. No. 12, 4, t. — Jackson, *Commercial Botany of the 19th Century*, 154.)

from which they differ in their smaller number of stamens united at the base into a tube free from the corolla, and in their legumes which, like those of Entada and Mimosa, mostly open by the separation of the thin walls from the persistent thickened margins.

The generic name, from λύσις and λῶμα, refers to the separation of the valves from the margins of the legume.

LYSILOMA LATISILIQUA.

Wild Tamarind.

LEAVES with 2 to 4 pairs of pinnæ; leaflets in 10 to 20 pairs, obliquely ovate or oblong.

Lysiloma latisiliqua, Bentham, *Trans. Linn. Soc.* xxx. 534 (*Rev. Mim.*) — Chapman, *Fl.* ed. 2, Suppl. 619. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 64.

Mimosa latisiliqua, Linnæus, *Spec.* 519. — Lamarck, *Dict.* i. 11. — Persoon, *Syn.* ii. 265.

Acacia latisiliqua, Willdenow, *Spec.* iv. 1067. — De Candolle, *Prodr.* ii. 467. — Macfadyen, *Fl. Jam.* 318. — Maycock, *Fl. Barb.* 403. — Don, *Gen. Syst.* ii. 418. — Nuttall, *Sylva*, ii. 34, t. 53.

L. Bahamensis, Bentham, *Hooker Lond. Jour. Bot.* iii. 82. — Dietrich, *Syn.* v. 506.

Acacia Bahamensis, Grisebach, *Fl. Brit. W. Ind.* 221.

A tree, forty or fifty feet in height, with a trunk two or three feet in diameter and stout spreading branches which form a wide flat head. The bark of the trunk varies from a quarter to half of an inch in thickness; it is dark brown, and separates into large plate-like scales, or, on the trunks of young vigorous trees and on the branches, is smooth and light gray tinged with pink. The branchlets are glabrous or somewhat pilose, conspicuously verrucose, and, like the leaf-stalks, bright red-brown when they first appear, becoming pale or light reddish brown in their second year. The leaves are four or five inches long, glabrous or sometimes slightly puberulous, and are borne on slender petioles an inch in length, marked near the middle with a conspicuous elevated gland. The stipules are foliaceous, half an inch long, ovate, acute, auricled and semicordate at the base, usually caducous but sometimes persistent until after the opening of the flowers. The pinnæ are short-stalked and twenty to forty-foliolate, with petioles enlarged and slightly glandular at the base. The leaflets are obliquely ovate or oblong, obtuse or acute, more or less unequal at the base by the greater development of one of the sides, sessile or shortly petiolulate, entire, reticulate-veined, light green, and paler on the lower than on the upper surface. The peduncles are from three quarters of an inch to an inch and a half long and are solitary or fascicled in the axils of the upper leaves, or are arranged in short terminal racemes; their bracts and bractlets are acute, membranaceous, and caducous, the former a third of an inch and the latter about a twelfth of an inch in length. The flower-heads, which in Florida appear early in April, are covered before the flowers open with thick pale tomentum, and after the exsertion of the stamens are two thirds of an inch in diameter. The calyx is broadly five-toothed, pilose on the outer surface especially above the middle, a twelfth of an inch long or half as long as the petals, which are united for two thirds of their length and reflexed at the apex. There are about twenty stamens, which are at least twice as long as the petals and are united for a quarter of their length into a slender tube. The legumes ripen in the autumn and remain on the branches until after the flowering period of the following year; they are four or five inches long, an inch broad, acute at the apex, and borne on stems an inch or two in length two or three together from a common peduncle abruptly and conspicuously enlarged at the apex. The valves are thin and papery, bronzy green when fully grown, and ultimately dark red-brown; they separate slowly from the margins, and probably not until after the pods have lain for some time on the ground, the exocarp first gradually breaking away from the endocarp. The seeds are half an inch long, oval or obovate, and compressed, with a thin lustrous dark brown coat.

Lysiloma latisiliqua grows in Florida on Key Largo, Elliott's, Plantation, and Boca Chica Keys, although it is not common on any of these islands. It inhabits the Bahamas and many of the West India Islands and perhaps Venezuela.[1]

[1] Bentham, *Trans. Linn. Soc.* xxx. 534 (*Rev. Mim.*)

The wood of *Lysiloma latisiliqua* is heavy, hard although not very strong, tough and close-grained. It has a smooth surface susceptible of receiving a fine polish, and contains many scattered small open ducts and numerous inconspicuous medullary rays. It is rich dark brown tinged with red, with nearly white sapwood an inch to an inch and a half in thickness, and composed of four or five thick layers of annual growth. The specific gravity of the absolutely dry wood is 0.6418, a cubic foot weighing 40.00 pounds. It is occasionally used and much esteemed in Florida in boat and ship building.

Lysiloma latisiliqua was discovered in the Antilles by Plumier, and was first described in Burmann's edition of his work on American plants.[1] It was first found in Florida by Dr. J. L. Blodgett[2] on the island of Key West, from which it has now entirely disappeared.

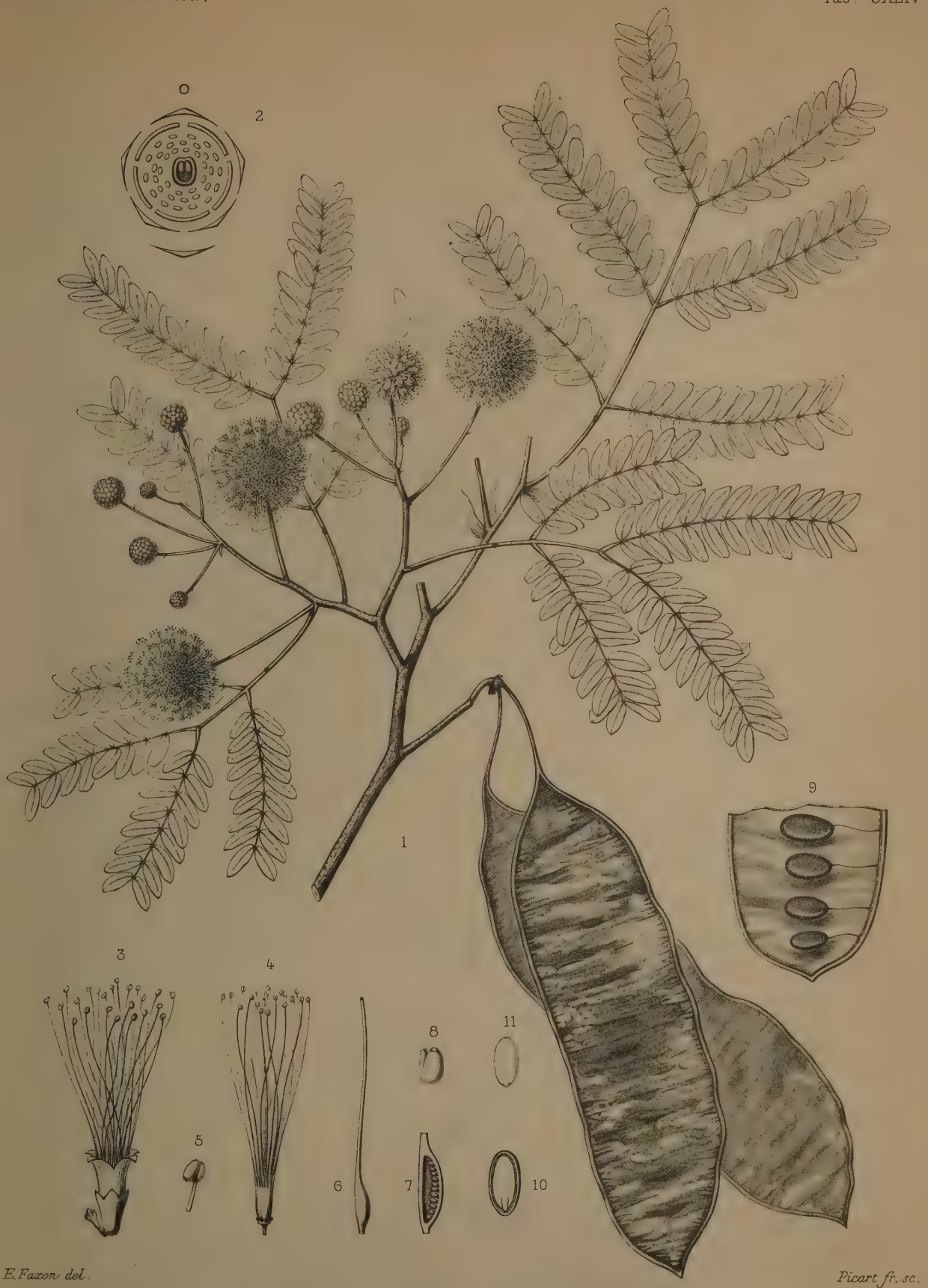
[1] *Acacia non spinosa, siliquis latis compressis, flore albo*, 3, t. 6. *Acacia non spinosa, flore albo, foliorum pinnis latiusculis glabris, siliquis longis planis*, Miller, *Dict.* ed. 7, No. 11.

[2] See i. 33.

EXPLANATION OF THE PLATE.

PLATE CXLIV. LYSILOMA LATISILIQUA.

1. A flowering and fruiting branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. A flower, the calyx and corolla removed, enlarged.
5. Portion of a stamen, enlarged.
6. A pistil, enlarged.
7. Vertical section of an ovary, enlarged.
8. An ovule, much magnified.
9. A portion of a legume, one of the valves removed, natural size.
10. Vertical section of a seed, enlarged.
11. An embryo, enlarged.



C.E. Faxon del. Picart fr. sc.

LYSILOMA LATISILIQUA, Benth.

A. Riocreux direx.t Imp. R. Taneur, Paris.

PITHECOLOBIUM.

FLOWERS perfect or rarely polygamous, in globose heads or in oblong or cylindrical spikes; calyx campanulate or tubular, 5 or occasionally 6-toothed, the teeth valvate in æstivation; petals as many as the teeth of the calyx, valvate in æstivation; stamens indefinite, united into a tube at the base; ovary many-ovuled. Legume 2-valved, the valves after opening variously contorted, or rarely indehiscent or articulate. Leaves bipinnate, usually glandular.

Pithecolobium, Martius, *Cat. Hort. Monac.* 188; *Herb. Fl. Brasil.* 114. — Meisner, *Gen.* pt. ii. 353. — Bentham & Hooker, *Gen.* i. 597. — Baillon, *Hist. Pl.* ii. 70.

Cathormion, Hasskarl, *Retzia*, i. 231.

Trees or shrubs, with slender branches unarmed or armed with spinescent stipules or axillary spines. Leaves alternate, petiolate, bipinnate; pinnæ many-foliolate with small leaflets, or few-foliolate with ample leaflets, or rarely three, two, or one-jugate, or unifoliolate; rachis generally marked by numerous glands between the pinnæ, and between the leaflets; stipules minute or inconspicuous, sometimes persistent, rigid or spinescent; leaflets usually penni-veined, occasionally many-nerved. Flowers perfect or sometimes polygamous, generally white, small or seldom large, produced from the axils of minute bractlets in pedunculate globose heads or in oblong cylindrical spikes. Peduncles from the axils of small deciduous bracts, solitary, fascicled or superposed, axillary or racemose or panicled at the end of the branches. Calyx campanulate or tubular, short-toothed. Corolla tubular or funnel-shaped, the petals united for more than half their length, hypogynous. Stamens many or indefinite, exserted, short or elongated, white or rose-color; filaments filiform, united at the base into a tube free from the corolla and almost as long; anthers minute, attached on the back, versatile, introrse, two-celled, the cells opening longitudinally. Ovary free in the bottom of the calyx, sessile or stipitate, many-ovuled, contracted into a slender filiform style; stigma terminal, minute or capitate; ovules suspended in two rows from the inner angle of the ovary, superposed, anatropous, the micropyle superior. Legume compressed, flat or occasionally subterete, before opening circinate, falcate or occasionally almost straight, coriaceous, solid or fleshy, rarely submembranaceous, two-valved, the valves, after opening, variously contorted, not elastically revolute, usually red on the inner surface, or indehiscent or sometimes breaking into indehiscent joints. Seed often surrounded by thin pulp, ovate or orbicular, compressed, suspended transversely, destitute of albumen; funicle filiform or variously expanded into a fleshy aril, the hilum near the base of the seed; testa thin, cartilaginous, sometimes marked on the two surfaces of the seed with a faint oval or horseshoe-shaped depression or opaque ring. Embryo filling the cavity of the seed; cotyledons flat, oval or orbicular, radicle straight, included or slightly exserted.

Pithecolobium is widely spread through the tropical and subtropical regions of the two worlds, especially in the tropics of America,[1] where more than half the species are found, and of Asia;[2] it is represented in tropical Africa[3] by a single species, and in Australia[4] by two or perhaps three species. About one hundred and twelve species are now recognized.[5] Four extend to the southern borders of

[1] Bentham, *Martius Fl. Brasil.* xv. pt. ii. 428. — Grisebach, *Fl. Brit. W. Ind.* 226. — Hemsley, *Bot. Biol. Am. Cent.* i. 359.

[2] Thwaites, *Enum. Pl. Zeylan.* 100. — Bentham, *Fl. Hongk.* 102. — Brandis, *Forest Fl. Brit. Ind.* 173. — Hooker f. *Fl. Brit. Ind.* ii. 302. — Oliver, *Hooker Icon.* xvi. t. 1510; xx. t. 1976.

[3] Oliver, *Fl. Trop. Afr.* ii. 363.

[4] Bentham, *Fl. Austral.* ii. 423.

[5] Bentham, *Trans. Linn. Soc.* xxx. 570 (*Rev. Mim.*).

the United States; one of these, *Pithecolobium Guadalupense*,[1] is a tall stout shrub of the Florida keys; the others are small trees.

Several species of Pithecolobium produce hard and valuable timber. The pods of *Pithecolobium dulce*,[2] a native of the tropical regions of southern Mexico, contain a sweet pulp which is cooked and eaten. This tree was early introduced by the Spaniards into the Philippine Islands and then into India, where it is now largely cultivated along the railroad lines, and as a hedge plant. It is also grown in coppice for fuel, and the fruit, known in India as Manilla tamarinds, is cooked and eaten; and oil is pressed from the seeds.[3] *P. Saman*,[4] a native of America from Venezuela to Peru, is now planted in most tropical countries as a shade tree, for which purpose its handsome foliage and rapid growth make it valuable,[5] and its edible pods are used as fodder. The bark of the West Indian and Floridian *P. Unguis-cati* is astringent and tonic.

Pithecolobium differs from Inga in its bipinnate leaves. It differs in its pods from Calliandra and Albizzia, which it resembles in its flowers, and from Acacia in the union of the stamens into a tube surrounding the ovary.

The generic name, from πίθηξ and ἑλλόβιον, relates to the shape of the contorted fruit of some of the species.

[1] Chapman, *Fl.* 116.

Inga Guadalupensis, Desvaux, *Jour. Bot.* v. 70. — Nuttall, *Sylva*, ii. 40, t. 55.

P. Unguis-cati, Bentham, *Trans. Linn. Soc. l. c.* 572 in part.

[2] Bentham, *Lond. Jour. Bot.* iii. 199; *Trans. Linn. Soc. l. c.* 372. — Beddome, *Fl. Sylv. S. Ind.* i. t. 188.

[3] Brandis, *Forest Fl. Brit. Ind.* 173.

[4] Bentham, *Hooker Lond. Jour. Bot. l. c.* 216; *Martius Fl. Brasil. l. c.* 442.

[5] Gamble, *Man. Indian Timbers*, 145. — Hillebrand, *Fl. Haw. Is.* 115.

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Pinnæ one or unequally two-jugate; legume curved or circinate, the valves contorted after dehiscence; seed surrounded by the enlarged ariloid funicle.

Pinnæ one-jugate; legume subtorulose, glabrous . . . . . 1. P. UNGUIS-CATI.

Pinnæ one or many-jugate; legume flat, straight, separating into membranaceous somewhat coriaceous valves more or less interrupted within.

Pinnæ three to five-jugate; legume shortly stipitate, the valves submembranaceous, only imperfectly divided within . . . . . 2. P. BREVIFOLIUM.

Pinnæ two or three-jugate; legume sessile, the valves thick and woody, tardily dehiscent . . . . . 3. P. FLEXICAULE.

PITHECOLOBIUM UNGUIS-CATI.

Cat's Claw.

FLOWERS polygamous, in globose heads. Legumes subtorulose, the valves much contorted after opening. Branches armed with rigid persistent spinescent stipules.

Pithecolobium Unguis-cati, Bentham, *Hooker Lond. Jour. Bot.* iii. 200; *Trans. Linn. Soc.* xxx. 572 (*Rev. Mim.*) — Dietrich, *Syn.* v. 514. — Grisebach, *Fl. Brit. W. Ind.* 226. — Chapman, *Fl.* 116. — Eggers, *Bull. U. S. Nat. Mus.* No. 13, 49. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 64.

Mimosa Unguis-cati, Linnæus, *Spec.* 517. — Miller, *Dict.* ed. 8, No. 13. — Aublet, *Pl. Guian.* ii. 944. — Lunan, *Hort. Jam.* ii. 2. — Descourtilz, *Fl. Med. Antil.* i. 51, t. 11. — Jacquin, *Hort. Schoenb.* iii. 74, t. 392.

Inga microphylla, Willdenow, *Spec.* iv. 1004. — Maycock, *Fl. Barb.* 400.

Inga Unguis-cati, Willdenow, *Spec.* iv. 1006. — De Candolle, *Prodr.* ii. 436. — Don, *Gen. Syst.* ii. 391. — Spach, *Hist. Vég.* i. 58. — Macfadyen, *Fl. Jam.* 306. — Nuttall, *Sylva*, ii. 37, t. 54.

Mimosa rosea, Vahl, *Eclog.* iii. 33, t. 25.

Inga forfex, Kunth, *Mim.* 52, t. 16.

Inga rosea, De Candolle, *Prodr.* ii. 437.

P. forfex, Bentham, *Hooker Lond. Jour. Bot.* iii. 199. — Dietrich, *Syn.* v. 514.

P. microphyllum, Bentham, *Hooker Lond. Jour. Bot.* iii. 200. — Dietrich, *Syn.* v. 514.

A glabrous tree, sometimes twenty or twenty-five feet in height, with a slender trunk seven or eight inches in diameter and a low flat irregular head; or more often a shrub with many vine-like almost prostrate stems. The bark of the trunk is a quarter of an inch thick, reddish brown, and divided by shallow fissures into small square plates. The branchlets are slender, somewhat zigzag, at first slightly striately angled, light gray-brown or sometimes dark reddish brown, covered with minute pale lenticels and armed with straight persistent rigid stipular spines broad at the base and a quarter of an inch in length, or rarely minute. The leaves are persistent and long-petiolate, with a single pair of bifoliolate pinnæ. The petioles are slender, faintly grooved on the upper side, from half an inch to an inch long, furnished at the apex with solitary conspicuous orbicular glands and tipped with the minute spinescent rachises. The secondary petioles, which vary from a quarter to half of an inch in length and are slightly and abruptly enlarged at the base, are furnished with glands between the short stout petiolules of the leaflets; these are obtuse, orbicular or broadly oblong, very oblique, and obtuse or rarely emarginate at the apex; they are entire, membranaceous, or somewhat coriaceous, reticulate-veined, bright green and lustrous on the upper, and paler on the lower surface, and vary from half an inch to two inches in length and from half an inch to an inch and a half in breadth. The flowers, which in Florida first open in March and continue to appear until midsummer, are produced in globular heads borne on slender peduncles an inch or an inch and a half long fascicled in the axils of the leaves or collected in ample panicles at the ends of the branches; their bracts are lanceolate, acuminate, chartaceous, a quarter of an inch in length, and early deciduous. The flowers are pale yellow, glabrous or slightly puberulous, and with their fully grown purple stamens are half an inch long. The calyx is rather less than a twelfth of an inch long, broadly toothed, and a quarter of the length of the acuminate petals which barely exceed the tube formed by the union of the filaments. The ovary is glabrous, long-stalked, and in the sterile flower minute or rudimentary. The legumes are compressed, slightly torulose, stipitate, rounded or acute at the apex, two to four inches long and from a quarter to half an inch broad; the valves are reticulate-veined, thickened on the margins, bright reddish brown, and after opening greatly and variously contorted. The seeds are irregularly obovate or sometimes nearly triangular, compressed or thickened, and a third of an inch long, the lower portion being surrounded by the enlarged bright

red ariloid funicles; the testa is thin, dark chestnut-brown, lustrous, and marked on the two sides of the seed with a faint oval ring.

Pithecolobium Unguis-cati is found in Florida on the shores of Caximbas Bay and on many of the southern keys, where it is generally distributed in the original forests and in the shrubby thickets which are replacing them on many of the islands: in its arborescent form it is now most abundant on the larger of the eastern keys, and probably attains its greatest size in Florida on Elliott's Key. It is widely and generally distributed through the Antilles and extends to Venezuela and New Granada.

The wood of *Pithecolobium Unguis-cati* is very hard, heavy, and close-grained, and contains numerous inconspicuous medullary rays. It has a rich red color varying to purple, with thin clear yellow sapwood. The specific gravity of the absolutely dry wood is 0.9049, a cubic foot weighing 56.39 pounds.

The bark of *Pithecolobium Unguis-cati* is astringent and diuretic, and in Jamaica was at one time considered a sovereign cure for many diseases.[1]

The first description of *Pithecolobium Unguis-cati* appeared in the *Paradisi Batavi Prodromus*[2] of Paul Hermann, published in Amsterdam in 1689; according to Aiton,[3] it was introduced into English gardens in 1690.

[1] The bark of the Nephritic-tree, as *Pithecolobium Unguis-cati* was once called in Jamaica, was, in the last century, according to Barham, then in such general use that it was hard to find a tree that had not been stripped. It was employed in the treatment of stone, gravel, and other urinary complaints, and of diseases of the liver and spleen. (Barham, *Hort. Amer.* 111.)

[2] *Unguis-cati arbor Americana siliquosa spinosa*, 385.

Acaciæ similis spinosa, ceratoniæ foliis geminatis, floribus albis lanuginosis, siliqua compressa corniculata, seminibus nigerrimis splendentibus, Kiggelaer, *Cat. Hort. Beaum.* 3.

Acaciæ quodammodo accedens, Myrobalano chebulo Veslingii similis arbor Americana spinosa, foliis Ceratoniæ in pediculo geminatis, siliqua bivalvi, compressa, corniculata, seu cochlearum, vel arietinorum cornuum in modum incurvata; sive Unguis-cati, Breyn, *Prodr.* ed. 1739, 38.

Acaciæ quodammodo accedens, s. Ceratiæ & Acaciæ media Jamaicensis spinosa bigeminatis foliis, flosculis stamineis, atronitente fructu, siliquis parum intortis, Plukenet, *Phyt.* t. 1, f. 6.

Acacia arborea major spinosa, pinnis quatuor, majoribus, subrotundis, siliquis varie intortis, Sloane, *Cat. Pl. Jam.* 152; *Fl. Jam.* ii. 56.

Mimosa foliis bigeminatis, Linnæus, *Hort. Cliff.* 207. — Royen, *Fl. Leyd. Prodr.* 470.

Acacia quadrifolia, siliquis circinatis, Plumier, *Cat.* 17: *Pl. Am.* ed. Burmann, 2, t. 4.

The Moabite; alias the Mangrove-Beard-Tree, Griffith Hughes, *The Natural History of the Barbados*, 193.

[3] Aiton, *Hort. Kew.* iii. 439.

EXPLANATION OF THE PLATE.

PLATE CXLV. PITHECOLOBIUM UNGUIS-CATI.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower-head with all but one flower removed, enlarged.
4. A staminate flower, the corolla laid open, enlarged.
5. Vertical section of a pistillate flower, enlarged.
6. Vertical section of a staminate flower, enlarged.
7. Front and rear views of an anther, enlarged.
8. An ovule, much magnified.
9. A fruiting branch, natural size.
10. A seed with its aril, enlarged.
11. A seed, enlarged.
12. Vertical section of a seed, enlarged.
13. An embryo, enlarged.

C.E.Faxon del.

Picart fr. sc.

PITHECOLOBIUM UNGUIS-CATI, Benth.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

PITHECOLOBIUM BREVIFOLIUM.

Huajillo.

FLOWERS perfect, in globose heads. Legume flat, straight, the valves not contorted after opening. Branches armed with rigid spinescent stipules.

Pithecolobium brevifolium, Bentham; Gray, *Smithsonian Contrib.* iii. 67 (*Pl. Wright.* i.); *Trans. Linn. Soc.* iii. 592 (*Rev. Mim.*). — Torrey, *Bot. Mex. Bound. Surv.* 62. — Havard, *Proc. U. S. Nat. Mus.* viii. 500. — Hemsley, *Bot. Biol. Am. Cent.* i. 359. — C. G. Pringle, *Garden and Forest*, ii. 393. — Sargent, *Garden and Forest*, ii. 400. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 101 (*Man. Pl. W. Texas*).

A tree, twenty-five or thirty feet in height, with a trunk rarely five or six inches in diameter and slender upright-growing branches which form a narrow irregular head; or more often a shrub sometimes only two or three feet in height. The bark of the trunk is smooth, light gray somewhat tinged with red, and often marked with large pale blotches. The branches are armed with stout rigid stipular spines sometimes half an inch long and persistent for many years; the branchlets are slightly striately angled and covered with minute white lenticels; when they first appear they are light gray and puberulous, and in their second year dark brown. The leaves are persistent or tardily deciduous, long-petiolate, two or three inches in length, two inches in breadth, and with eight to twelve pinnæ; when they unfold they are coated with pale tomentum, but at maturity are glabrous with the exception of a faint pubescence covering the petioles and rachises. The petioles are slender, terete, an inch long, and furnished near the middle with a dark oblong gland. The leaflets are in ten to twenty pairs and are oblong, linear, obtuse or acute at the apex, oblique at the base by the greater development of one of the sides, very short-petiolulate, from a sixth to a quarter of an inch in length, light green on the upper, and paler on the lower surface. The flowers are collected in globose or oblong heads half an inch in diameter and borne on thin pubescent peduncles which, when they first appear, are coated like the flower-buds with thick white tomentum; they are bracteolate at the apex, and are developed from the axils of lanceolate acute scarious deciduous bracts, and arranged in short racemes on the ends of the branches. The flowers are white or pale yellow, and when the stamens are fully grown are nearly half an inch long. The calyx is shortly five-lobed, puberulous on the outer surface, and about a twenty-fourth of an inch long or one quarter the length of the petals, which are puberulous on both surfaces, and, with the stamens, are persistent at the base of the fully grown fruit. The legumes, which ripen in midsummer and often remain on the branches after opening until the trees flower the following year, are straight, compressed, slightly torulose, short-stalked, contracted at the apex into a short slender point, four to six inches long and two thirds of an inch broad. Their valves are somewhat membranaceous, thick-margined, reddish brown on the outer, and yellow tinged with red on the inner surface, and reticulate-veined. The seeds are suspended transversely by slender coiled and somewhat dilated funicles, and are compressed, ovate, or nearly orbicular and a quarter of an inch long; the testa is thin, dark chestnut-brown, very lustrous, and faintly marked on the two sides of the seed with large oval depressions.

Pithecolobium brevifolium is scattered in Texas along the bluffs and on the bottom-lands of the lower Rio Grande, occurring only at a few places between Rio Grande City and the mouth of the river. In Texas it is usually a low shrub spreading into broad clumps, but occasionally, in the rich and comparatively moist soil of the river lagoons, a slender straggling tree. In Mexico, from the mouth of the Rio Grande to the Sierra Madre, it is much more common. Here it grows to its largest size and, with

the Acacia, the Parkinsonia, and the Cercidium, forms a characteristic feature of the arborescent vegetation.

The foliage is eaten by sheep and goats in winter.[1]

Pithecolobium brevifolium was discovered by Jean Louis Berlandier near the mouth of the Rio Grande in 1830.[2]

[1] Havard, *Proc. U. S. Nat. Mus.* viii. 500.

[2] The wood of *Pithecolobium brevifolium* is dark-colored, heavy, and rather hard, but I have not been able to obtain a piece large and sound enough to determine satisfactorily its specific gravity and fuel value.

EXPLANATION OF THE PLATE.

PLATE CXLVI. PITHECOLOBIUM BREVIFOLIUM.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. A pistil, enlarged.
5. A fruiting branch, natural size.
6. A seed, enlarged.
7. Vertical section of a seed, enlarged.
8. An embryo, enlarged.

C. E. Faxon del. Pleut ft. sc.

PITHECOLOBIUM BREVIFOLIUM, Benth.

A. Riocreux direx.t Imp. R. Taneur. Paris.

PITHECOLOBIUM FLEXICAULE.

Ebony.

FLOWERS perfect, in axillary spikes. Legume thick and woody, interrupted within. Branches armed with rigid spinescent stipules.

Pithecolobium flexicaule, Coulter, *Contrib. U. S. Nat. Herb.* ii. 101 (*Man. Pl. W. Texas*).

Pithecolobium Texense, Coulter, *Contrib. U. S. Nat. Herb.* No. 2, 37; *Bot. Gazette*, xv. 269.

Acacia flexicaulis, Bentham, *Lond. Jour. Bot.* i. 505; *Trans. Linn. Soc.* xxx. 514 (*Rev. Mim.*). — Walpers, *Rep* i. 913. — Dietrich, *Syn.* v. 497. — Gray, *Smithsonian Contrib.* iii. 65 (*Pl. Wright.* i.); *Proc. Am. Acad.* v. 158. — Torrey, *Bot. Mex. Bound. Surv.* 62. — Hemsley, *Bot. Biol. Am. Cent.* i. 353. — C. G. Pringle, *Garden and Forest*, ii. 394. — Sargent, *Garden and Forest*, ii. 400, f. 123. — Havard, *Proc. U. S. Nat. Mus.* viii. 499.

A tree, twenty to thirty feet in height, with a straight trunk two or three feet in diameter, separating, eight or ten feet from the ground, into short spreading branches which form a wide round head. The branches are stout, zigzag, covered with pale lenticels and armed with persistent stipular pale chestnut-brown spines from a quarter to half an inch in length; when they first appear they are puberulous and are sometimes light green and sometimes dark reddish brown; in their second year they are glabrous or rarely puberulous, and usually dark reddish brown or often light gray. The leaves are persistent, long-petiolate with slender puberulous petioles and rachises, with four to six pinnæ, an inch and a half to two inches long and two and a half to three inches broad. The petioles are glandular near the middle, and furnished at the apex with small orbicular solitary glands; the pinnæ are six to twelve, usually six-foliolate, the lower pair often the shortest; the leaflets are ovate-oblong, rounded at the apex, reticulate-veined, membranaceous or subcoriaceous, glabrous, dark green and lustrous on the upper surface and paler on the lower, from a quarter to a third of an inch in length, and borne on short broad petiolules. The flowers, which appear from June until August, are produced in cylindrical dense or interrupted spikes an inch and a half long on stout pubescent peduncles fascicled in the axils of the upper leaves of the previous year; they are sessile in the axils of minute caducous bracts, light yellow or cream color and deliciously fragrant, and with the exserted stamens are an eighth of an inch in length. The corolla is four or five times as long as the calyx, like this puberulous on the outer surface, and about as long as the tube formed by the union of the filaments. The ovary is glabrous and sessile. The legumes, which ripen in the autumn and remain on the branches until after the flowering season of the following year, are tardily dehiscent; they are flattened, turgid, straight or slightly falcate, sessile, oblique at the base, rounded and contracted into a short broad point at the apex, four to six inches long and an inch to an inch and a quarter broad, with thick woody valves lined with a thick pithy substance inclosing and separating the seeds. These are suspended transversely on very short straight funicles, and are half an inch in length, a quarter of an inch in breadth, irregularly obovate and usually more or less flattened on one side; the testa is thick, crustaceous, bright reddish brown, and faintly marked on the two sides of the seed with a short oblong depression.

Pithecolobium flexicaule is distributed from the shores of Matagorda Bay in Texas to the Sierra Madre in Nuevo Leon and has been found at La Paz in Lower California.[1] It is common on the bluffs of the Gulf coast in Texas and on those of both banks of the lower Rio Grande, and south of the river is one of the commonest and most beautiful trees of the region.

The wood of *Pithecolobium flexicaule* is exceedingly heavy, hard, compact, and close-grained, with

[1] Vasey & Rose, *Contrib. U. S. Nat. Herb.* No. 3, 69.

a satiny surface, the layers of annual growth being hardly distinguishable. It is very dark rich reddish brown slightly tinged with purple, with thin clear bright yellow sapwood. The specific gravity of the absolutely dry wood is 1.0386, a cubic foot weighing 64.72 pounds.[1] It is highly prized by cabinet-makers, and for fuel is considered more valuable than the wood of any other tree of the Rio Grande valley. It is almost indestructible in contact with the ground, and is therefore largely used for fence-posts.

The seeds are palatable and nutritious if boiled when green, and are roasted when ripe by the Mexicans, who use their thick coat as a substitute for coffee.[2]

Pithecolobium flexicaule was discovered by Jean Louis Berlandier in the neighborhood of Matamoras in 1830. With the exception, perhaps, of *Leucæna pulverulenta* and of *Acacia Farnesiana*, it is the most beautiful of the Mimosa-like trees which grow naturally within the territory of the United States. It is compact in habit; its foliage is luxuriant, dark, and lustrous; the flowers, which are produced during a long period of every year, are abundant, beautiful, and fragrant, and the fruit is large and of striking appearance. *Pithecolobium flexicaule* might well be introduced into the gardens of many temperate countries, and although it grows slowly and does not attain a great size, it may prove worthy of the attention of planters as a timber-tree.

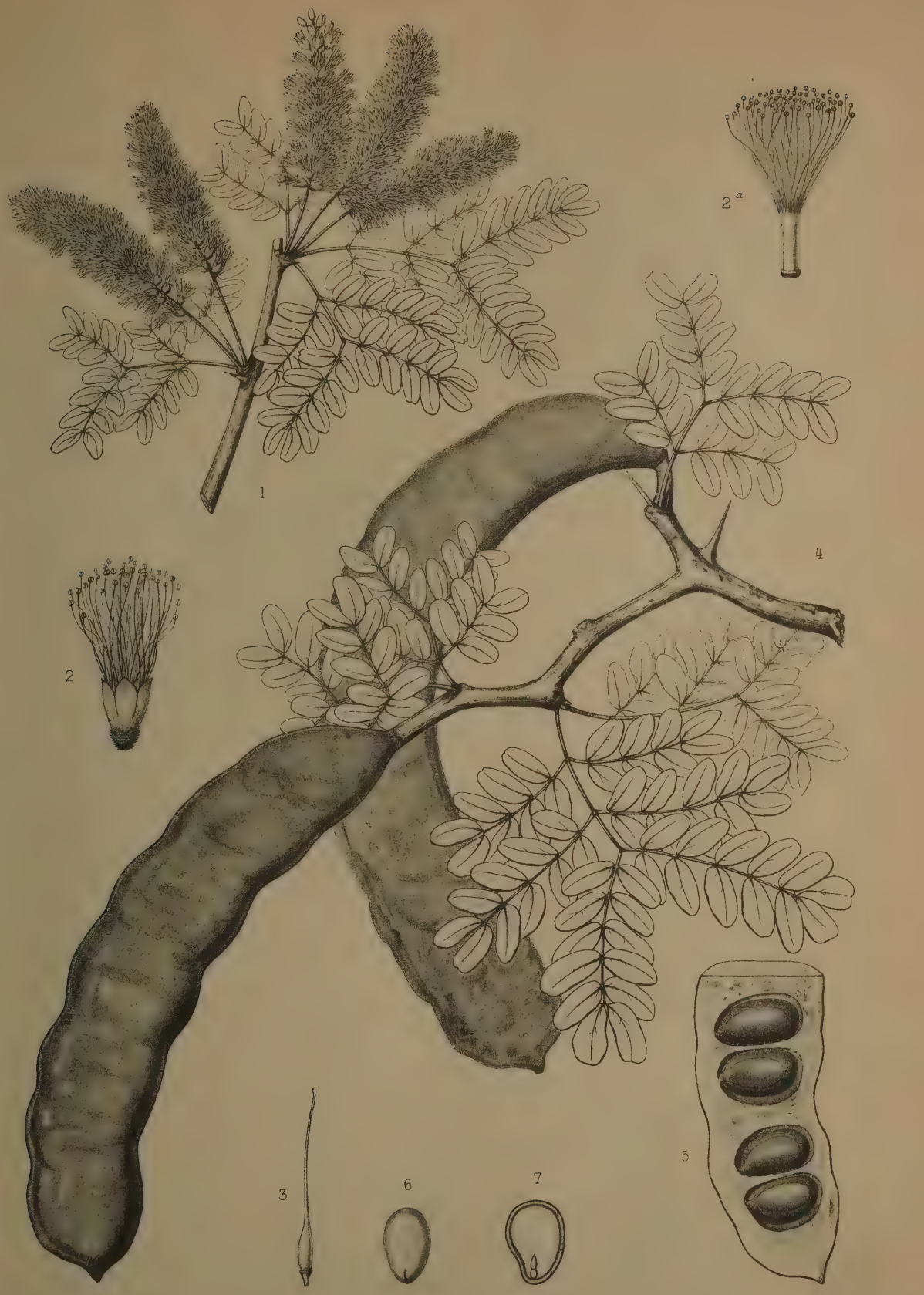
[1] *Garden and Forest*, iii. 344.

[2] Havard, *Proc. U. S. Nat. Mus.* viii. 499.

EXPLANATION OF THE PLATE.

PLATE CXLVII. PITHECOLOBIUM FLEXICAULE.

1. A flowering branch, natural size.
2. A flower, enlarged.
2ª. A flower, the calyx and corolla removed, enlarged.
3. A pistil, enlarged.
4. A fruiting branch, natural size.
5. Vertical section of a portion of a legume, natural size.
6. An embryo, natural size.
7. Vertical section of a seed, natural size.



C E Faxon del. Picart fr. sc.

PITHECOLOBIUM FLEXICAULE, Coult.

A. Riocreux direx.t Imp. R. Taneur, Paris.

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THE

SILVA OF NORTH AMERICA

A DESCRIPTION OF THE TREES WHICH GROW NATURALLY IN NORTH AMERICA EXCLUSIVE OF MEXICO

BY

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Illustrated with Figures and Analyses drawn from Nature

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AND ENGRAVED BY

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VOLUME IV.

ROSACEÆ—SAXIFRAGACEÆ

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To

HORATIO HOLLIS HUNNEWELL,

A TRUE LOVER OF TREES,

AND

A WISE AND GENEROUS PATRON OF THE ARTS AND SCIENCES,

THIS FOURTH VOLUME OF

THE SILVA OF NORTH AMERICA

IS DEDICATED

SYNOPSIS OF THE ORDERS OF PLANTS CONTAINED IN VOLUME IV. OF THE SILVA OF NORTH AMERICA.

CLASS I. **DICOTYLEDONOUS or EXOGENOUS PLANTS.**

Stems increasing in diameter by the annual addition of a layer of wood inside the bark. Leaves netted-veined. Embryo with a pair of opposite cotyledons.

SUB-CLASS I. **Angiospermæ.** Pistil, a closed ovary containing the ovules and developing into the fruit.

DIVISION I. **Polypetalæ.** Flowers with calyx and corolla, the latter divided into separate petals.

C. CALYCIFLORÆ. Sepals rarely distinct. Disk adnate to the base of the calyx, rarely tumid or conspicuous or wanting (Mimosæ). Petals usually as many as the lobes of the calyx, or fewer by abortion, inserted on the margin of the calyx-tube or of the disk, occasionally wanting. Stamens definite or indefinite, perigynous or hypogynous. Ovary superior.

20. **Rosaceæ.** Flowers usually regular. Stamens distinct, usually indefinite. Carpels 1-many, distinct or (in Pomeæ) united and combined with the calyx-tube. Style often lateral or basal. Ovules usually 2, anatropous. Seeds generally exalbuminous. Leaves usually alternate, dentate, lobed or divided, usually stipular.

21. **Saxifragaceæ.** Flowers usually regular. Stamens mostly 5 to 10. Carpels usually 2, united or rarely free. Ovules numerous, anatropous. Styles free or united at the base. Seeds albuminous. Leaves opposite or alternate, stipular or exstipular.

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SILVA OF NORTH AMERICA.

CHRYSOBALANUS.

FLOWERS perfect; calyx 5-lobed, the lobes imbricated in æstivation; petals 5, imbricated in æstivation; stamens 15 to 50; ovary 1-celled; ovules 2, ascending. Fruit a fleshy drupe, 1-seeded. Leaves alternate, entire.

Chrysobalanus, Linnæus, *Gen.* 365. — A. L. de Jussieu, *Gen.* 340. — Meisner, *Gen.* 102. — Endlicher, *Gen.* 1251. — Bentham & Hooker, *Gen.* i. 606. — Baillon, *Hist. Pl.* i. 480.

Icaco, Adanson, *Fam. Pl.* ii. 305.

Trees or shrubs, with stout branchlets covered with pale lenticels, and fibrous roots. Leaves alternate, entire, coriaceous, short-petiolate, persistent; stipules minute, deciduous. Flowers short-pedicellate, small, creamy white, in axillary or terminal dichotomously-branched silky canescent cymes with divisions developed from the axils of conspicuous deciduous bracts. Calyx turbinate-campanulate, five-lobed, ebracteolate, deciduous. Disk thin, adnate to the calyx-tube. Petals five, inserted in the mouth of the calyx-tube on the margin of the disk, alternate with the lobes of the calyx, spatulate, deciduous. Stamens fifteen, in groups of three opposite the lobes of the calyx, or indefinite in a single continuous series, inserted with the petals on the margin of the disk; filaments filiform, free or slightly connate at the base; anthers ovoid, introrse, two-celled, the cells opening longitudinally, or sometimes wanting. Ovary sessile in the bottom of the calyx-tube, hirsute or glabrous, one-celled; style rising from the base of the ovary, filiform, terminated by a minute truncate stigma; ovules two, collateral, ascending, anatropous; raphe dorsal, the micropyle inferior. Fruit drupaceous; epicarp smooth, membranaceous; mesocarp pulpy; putamen coriaceous or crustaceous, more or less adherent to the mesocarp, smooth and indehiscent, or five or six-angled toward the base and imperfectly five or six-valved, the valves reticulate-veined. Seed suberect, exalbuminous; testa chartaceous, light brown. Embryo filling the cavity of the seed; cotyledons thick and fleshy; radicle inferior, very short.

The genus Chrysobalanus is represented in the southern Atlantic states by a shrubby species[1] confined to the coast region of Georgia, Florida, and Alabama; and a second species which occasionally attains the size of a small tree inhabits the shores of southern Florida, and is widely distributed through the maritime regions of tropical America, and, in various forms which have sometimes been considered species along the coast of western tropical Africa.[2]

[1] *Chrysobalanus oblongifolius*, Michaux, *Fl. Bor.-Am.* i. 283. — Pursh, *Fl. Am. Sept.* i. 329. — Nuttall, *Gen.* i. 301. — Elliott, *Sk.* i. 539. — De Candolle, *Prodr.* ii. 526. — Torrey & Gray, *Fl. N. Am.* i. 406. — Chapman, *Fl.* 119.

Persea longipeda, Bertoloni, *Misc. Bot.* fasc. xiii. t. 2.

[2] Alphonse de Candolle (*Géographie Botanique*, ii. 784, 792) was inclined to believe that *Chrysobalanus Icaco* was of American origin, and had been naturalized on the African coast by seed carried from one continent to the other by the Atlantic currents, or by man. The view that it was transported across the Atlantic from the New World to the Old by ocean currents is supported by the fact that the early European travelers found the Cocoa Plum in

The generic name, from χρυσός and βάλανος, was established by Linnæus, who discarded Plumier's name of Icaco.[1]

America; the seeds, too, are well suited to float, their structure protecting them for a long time from the influence of salt water, and as the species inhabits the shores of the ocean the seed washed up on such shores would find suitable conditions for germination. The Cocoa Plum, moreover, grows spontaneously in Africa only on the west coast, or opposite America, while in the New World it is as common on the Pacific as on the Atlantic seaboard. On the other hand, the fact that the French in Senegal call it Prune d'Amérique might indicate that it had first been carried to Africa by man, and then, having become naturalized, had gradually spread along the coast.

[1] *Nov. Pl. Am. Gen.* 43, t. 5.

CHRYSOBALANUS ICACO.

Cocoa Plum.

STAMENS indefinite. Stone 5 or 6-angled, imperfectly 5 or 6-valved. Leaves broadly elliptical or round-obovate.

Chrysobalanus Icaco, Linnæus, *Spec.* 513 (excl. vars.). — Jacquin, *Enum. Pl. Carib.* 23; *Stirp. Am.* 154, t. 94; *Select. Stirp. Am. Hist.* 75, t. 141. — *Icon. Am. Gewäch.* ii. 36, t. 157. — Aublet, *Pl. Guian.* i. 513. — Houttuyn, *Syst.* i. 756, t. 11, f. 2. — Lamarck, *Dict.* iii. 224; *Ill.* ii. 542, t. 428. — Willdenow, *Spec.* ii. pt. ii. 998. — Persoon, *Syn.* ii. 36. — Rees, *Cyclopædia*, viii. — Poiret, *Lam. Dict.* Suppl. iii. 135. — Lunan, *Hort. Jam.* i. 211. — Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 244. — Kunth, *Syn. Pl. Æquin.* iii. 483. — De Candolle, *Prodr.* ii. 525. — *Dict. Sci. Nat.* xxii. 430, t. 236. — Sprengel, *Syst.* ii. 478. — Tussac, *Fl. Antill.* iv. 91, t. 31. — Maycock, *Fl. Barb.* 215. — Don, *Gen. Syst.* ii. 477. — Spach, *Hist. Vég.* i. 369, t. 5, f. 4. — Torrey & Gray, *Fl. N. Am.* i. 406. — Dietrich, *Syn.* iii. 46. — Walpers, *Rep.* ii. 1; *Ann.* iv. 642. — Bentham, *Bot. Voy. Sulphur*, 91. — Blume, *Mus. Bot. Lugd. Bat.* ii. 90. — Richard, *Fl. Cub.* ii. 237. — Chapman, *Fl.* 119. — Grisebach, *Fl. Brit. W. Ind.* 229. — Schnizlein, *Icon.* t. 274. — Baillon, *Adansonia*, vii. 221; *Hist. Pl.* i. 427, f. 486, 487. — Hooker f. *Martius Fl. Brasil.* xiv. pt. ii. 7. — Hemsley, *Bot. Biol. Am. Cent.* i. 365. — Eggers, *Bull. U. S. Nat. Mus.* No. 13, 50. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 64.

Chrysobalanus Icaco, *β.* **purpureus**, Persoon, *Syn.* ii. 36.

A tree, twenty-five to thirty feet in height, with a long straight trunk occasionally a foot in diameter, or more often a tall broad bush with many upright virgate branches, or often, in exposed situations, a semiprostrate shrub a foot or two high. The bark of the trunk is an eighth of an inch thick, with a light gray surface tinged with red which separates into long thin scales. The branches, when they first appear, are glabrous or sometimes slightly pilose and dark reddish brown; they are soon marked with conspicuous pale lenticels, and in their second year are brown or gray-brown. The leaves are broadly elliptical or round-obovate, rounded or slightly emarginate at the apex, and wedge-shaped at the base; they are borne on short stout petioles, and are glabrous, coriaceous, obscurely reticulate-veined, dark green and lustrous on the upper, and light yellow-green on the lower surface, with broad conspicuous midribs rounded on the upper side, and thin primary veins; they vary from an inch to three inches and a half in length, and from an inch to two inches and a half in width, and, standing on the branches at an acute angle, seem to be pressed against them. The stipules are acuminate, an eighth of an inch in length, and early deciduous. The flowers are produced in cymes one to two inches in length, which in Florida appear continuously on the growing branches during the spring and summer months; they are borne on short thick club-shaped pedicels which, like the acute deciduous bracts and bractlets, and the outer surface of the calyx, are covered with thick hoary tomentum. The calyx-lobes are nearly triangular, acute, more or less pubescent on the inner surface, and half the length of the narrow spatulate white petals. The stamens are exserted, with slender hairy filaments, and are sometimes abortive on one side of the flower by the suppression of some of the anthers. The ovary is covered with hoary pubescence, and from its base rises the long slender style, clothed nearly to the apex with pale hairs. The fruits, of which one or two only develop from an inflorescence, are nearly spherical, or often slightly ovoid, and from two thirds of an inch to an inch and a half in diameter; the skin is smooth, bright pink, yellow, purple, creamy white, or sometimes nearly black; the flesh is white, sweet, and juicy, often a quarter of an inch thick, and more or less adherent to the stone. This is pointed at both ends, five or six-angled, especially below the middle, half an inch to an inch and a quarter in length and twice as long as broad, indehiscent, or finally dehiscent into five or six valves; the wall is composed of a thin red-brown dry outer layer, and a thick

interior layer of hard woody fibre, or in the black-fruited form is thin and soft. The testa of the seed is thin and papery, light red-brown, and lined with a thick white reticulated fibrous coat.

Chrysobalanus Icaco grows in Florida from Cape Canaveral to the shores of Bay Biscayne, and on the west coast from Caximbas Bay to the southern keys. It is common on the shores of the Antilles and on those of southern Mexico and Central America; it is found on the northern and eastern coasts of South America, where it extends as far south as southern Brazil, and occurs on the west coast of Africa from Senegambia to the Congo country.[1] In Florida the Cocoa Plum is usually shrubby, and attains the size and habit of a tree only on the shores of the islands of the Everglades, in the neighborhood of Bay Biscayne, and on the banks of the Miami River above the influence of tide-water, where it sometimes forms dense impenetrable thickets of considerable extent.

The wood of *Chrysobalanus Icaco* is heavy, hard, strong, and close-grained, and contains a few irregularly distributed open ducts and many thin medullary rays; it is light brown, often tinged with red, with thin lighter colored sapwood composed of ten or twelve layers of annual growth. The specific gravity of the absolutely dry wood is 0.7709, a cubic foot weighing 48.04 pounds.

The fruit, which resembles a plum in size and shape, is sweet and rather insipid; it varies in color and in the amount of juice contained in the flesh, in the degree to which this adheres to the stone, and in the thickness of the wall of the stone.[2] It appears to have been a favorite food of the Caribs at the time of the discovery of America, and it is mentioned in many of the early narratives.[3] It is eaten by negroes and sometimes by whites, both fresh and preserved in sugar. The seeds when fresh have an agreeable odor, although they soon become rancid, and are considered a delicacy in the West Indies; they contain a considerable quantity of oil, and under the name of varach seeds are sometimes sent to England from tropical Africa; strung on sticks, they are used instead of candles by the natives.[4] The

[1] Guillemin, Perrottet & A. Richard, *Fl. Seneg. Tent.* i. 272. — Hooker f. & Bentham, *Hooker Niger Fl.* 336. — Oliver, *Fl. Trop. Afr.* ii. 365.

[2] In Florida *Chrysobalanus Icaco* varies but little in the size and shape of the leaves, or in the form of the fruit. This is usually pink, or occasionally nearly white; on some individuals, however, it is black, and then is smaller and more or less ovate, with narrower and rather softer stones than occur in the more spherical pink or white-skinned fruit, the two forms apparently never growing on the same plant. Within the tropics it shows a greater tendency to variation. Hooker f. (*Martius Fl. Brasil.* xiv. pt. ii. 7) considered the American and African plants specifically identical, and proposed these varieties: —

α. *genuinus:* leaves broadly obovate, obcordate, or orbiculate; drupe fleshy, ovoid or obovoid, obtusely ribbed.

β. *pellocarpus:* leaves as in the variety α, although often smaller; drupe obovoid, narrowed at the base, subacutely ribbed; flesh thin.

Chrysobalanus pellocarpus, Meyer, *Prim. Fl. Esseq.* 193. — Bentham, *Hooker Jour. Bot.* ii. 214. — Grisebach, *Fl. Brit. W. Ind.* 229.

Chrysobalanus Icaco, var. β. *pellocarpus*, De Candolle, *Prodr.* ii. 525.

Guiana.

γ. *ellipticus:* leaves elliptical-oblong, acute or subacute at the two extremities; drupe as in variety α, but smaller.

Chrysobalanus ellipticus, Sabine, *Trans. Hort. Soc. Lond.* v. 453. — De Candolle, *Prodr.* ii. 526. — Hooker f. & Bentham, *l. c.* — Oliver, *l. c.*

(?) *Chrysobalanus luteus*, Sabine, *l. c.* — De Candolle, *l. c.*

Upper and Lower Guinea.

To this form, too, should perhaps be referred the African *Chrysobalanus orbicularis*, Schumacher & Thonning, *Kongl. Dansk. Vidensk. Selsk. Afh.* iv. 6; *Pl. Guin.* ii. 5. — Walpers, *Rep.* ii. 907.

[3] *De los árboles é fructas llamados hicacos*, Oviedo, *Hist. Nat. Gen. Ind.* lib. viii. cap. 9.

"La Fruta de Cuesco son Hobos, Hicacos, Macaguas, Guiabaras, i Mameis, que es la mejor de todas." (Francisco Lopez de Gomara, *Hist. Gen. de las Indias*, cap. xxviii.)

Arbor folia fert similia Lauri foliis, Marcgrave, *Hist. Nat. Bras.* lib. iii. cap. ix. (cum icone).

Des Prunes de Icaques. "Ce fruit est fort dous, & tellement aimé de certains Sauvages, qui demuerent pres du Golfe d'Hondures, qu'on les appelle *Icaques*, à cause de l'état qu'ils font de ces Prunes, qui leur servent de nourriture." (Rochefort, *Hist. Nat. et Morale des Antilles*, 74 [cum icone].)

Prunier d'Icaque. "Il y en a de plusieurs especes, qu'on distingue seulement par la couleur du fruit, dont les uns sont rouges, les autres violets, les autres blancs, mais tous de même forme, même chair, même goût, même vertu." (Labat, *Nouveau Voyage aux Isles de l'Amérique*, iii. 40.)

Frutex cotini fere folio crasso in summitate deliquium patiente, fructu ovali cœruleo ossiculum angulosum continente, Catesby, *Nat. Hist. Car.* i. 25, t. 25.

Chrysobalanus, Linnæus, *Hort. Cliff.* 484 (excl. syn.). — Plumier, *Pl. Am.* ed. Burmann, 151, t. 158.

The Fat Pork-Tree, Griffith Hughes, *Nat. Hist. Barbados*, 180.

Chrysobalanus fruticosus, foliis orbiculatis alternis, floribus laxe racemosis, Browne, *Nat. Hist. Jam.* 250, t. 17, f. 5.

Icaquier, Nicolson, *Essai sur l'Histoire Naturelle de l'Isle de Saint-Domingue*, 248.

Chrysobalanus seu Icaco, fructu nigro, fructu albo, fructu violaceo, Pouppé Desportes, *Histoire des Maladies de S. Domingue*, iii. 244.

[4] Spons, *Encyclopædia of the Industrial Arts, Manufactures, and Raw Commercial Products*, ii. 1414. — Tussac, *Fl. Antill.* iv. 92.

bark, leaves, and roots are astringent, and have been employed in tropical America in the treatment of diarrhœa, leucorrhœa, and hemorrhages.[1]

The earliest mention[2] of *Chrysobalanus Icaco* as an inhabitant of Florida appears in *A Concise Natural History of East and West Florida*, written by the distinguished engineer Bernard Romans,[3] and published in New York in 1775.

Chrysobalanus Icaco was introduced into the Physic Garden at Chelsea in England by Philip Miller[4] in 1752,[5] and is occasionally cultivated in tropical regions of the Old World.[6]

Icaco, the specific name, is probably of Carib origin.[7]

[1] Tussac, *Fl. Antill.* iv. 92. — Endlicher, *Enchirid. Bot.* 665. — *Treasury of Botany*, i. 278. — Martius, *Fl. Brasil.* xiv. pt. ii. 75. — Baillon, *Hist. Pl.* i. 459.

[2] "A few spots of *hammock*, or upland, are found on this island; these produce the *zantoxylum*, ficus citri-folio, Coccoloba, Mastic, Borassus, and a few trees of the live oak and willow oak, the Chrysobalanus, & the *Cereus Triangularis*, and with these that kind of *Cactus* commonly called *Opuntia*," 283.

[3] Bernard Romans, a native of Holland, received in England the education of an engineer, and was afterwards employed by the English government as a surveyor in the southern colonies of North America. He appears to have lived from 1763 to 1771 in Florida, where he paid some attention to natural history, enjoying a salary of fifty pounds a year as King's Botanist. During his residence in New York Romans became imbued with the revolutionary spirit and was engaged by the Committee of Safety to prepare a scheme for the defense of the Highlands; but his relations with the committee were unsatisfactory, his plans were not adopted, and he was relieved from duty. In 1776 he was commissioned captain of a company of Pennsylvania artillery. Charges of misconduct were soon preferred against him, but he was probably acquitted, as not long afterwards he was deputed by General Gage to inspect the works at Fort Ann and Skenesborough, and in 1780 was ordered to South Carolina to join the Southern Army. Romans sailed from New Haven or New London in a vessel which was captured by the British and taken to Jamaica, where he was held as a prisoner until the end of the war in 1783, when he was put on board of a ship bound for the United States. He died on the voyage, his friends believed a violent death (see Munsell's Historic Series, No. 5, *Obstructions to the Navigation of Hudson's River*, by E. M. Ruttenber, Introduction, 9). In addition to the work on Florida, of which only the first volume appeared, and which is now an extremely rare book, as the largest part of the edition was destroyed by fire in New York, Romans, who was a member of the American Philosophical Society, printed in 1773, in its Transactions, a paper on *The Marine Compass;* in 1775 he published *A Map of the Civil War in America;* in 1778, at Hartford, Connecticut, the first volume of his *Annals of the Troubles in the Netherlands*, the second volume of which appeared four years later, and in 1779, with J. G. W. de Braham, *A Complete Pilot for the Gulf Passage.* The History of East and West Florida is a work of no little interest to botanists, as Romans was the first person with any knowledge of plants who visited the coasts and islands of southern Florida; it gives the earliest account of the Ogeechee Lime, and of the Florida Fig, *Ficus aurea*, and first makes known the fact that several West India trees are found on the Florida coast.

[4] See i. 38.

[5] Aiton, *Hort. Kew.* ii. 166.

[6] Voigt, *Hort. Sub. Calcutt.* 265. — Hooker f. *Fl. Brit. Ind.* ii. 307. — Naudin, *Manuel de l'Acclimateur*, 204.

[7] *Hicacos* was first used by Oviedo y Valdes (*Hist. Nat. Gen. Ind.* lib. viii. cap. 9), who landed in San Domingo in 1514, to describe the fruit of this plant, which has given its name to numerous capes and points of land on the coast of the West Indies and Central America.

EXPLANATION OF THE PLATE.

Plate CXLVIII. Chrysobalanus Icaco.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. Front and rear views of a stamen, enlarged.
6. A pistil, a vertical section of the ovary removed, enlarged.
7. An ovule, much magnified.
8. A fruiting branch, natural size.
9. Vertical section of a fruit, natural size.
10. A stone, natural size.
11. An embryo, natural size.

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CHRYSOBALANUS ICACO, L.

A. Riocreux direx.t Imp. R. Taneur, Paris.

PRUNUS.

FLOWERS perfect, or rarely polygamo-diœcious by abortion; calyx 5-lobed, the lobes imbricated in æstivation; petals 5, imbricated in æstivation, rarely wanting; stamens 15 to 30; pistil 1, rarely 2 or more; ovules 2, suspended. Fruit a more or less fleshy drupe, 1-seeded. Leaves alternate.

Prunus, Bentham & Hooker, *Gen.* i. 609. — Baillon, *Hist. Pl.* i. 478.

Amygdalus, Linnæus, *Gen.* 141. — Adanson, *Fam. Pl.* ii. 305. — A. L. de Jussieu, *Gen.* 341. — Meisner, *Gen.* 102. — Endlicher, *Gen.* 1250.

Prunus, Linnæus, *Gen.* 141. — Adanson, *Fam. Pl.* ii. 305. — A. L. de Jussieu, *Gen.* 341. — Meisner, *Gen.* 102. — Endlicher, *Gen.* 1250.

Cerasus, Linnæus, *Gen.* 141. — Adanson, *Fam. Pl.* ii. 305. — A. L. de Jussieu, *Gen.* 340. — Meisner, *Gen.* 102.

Padus, Linnæus, *Gen.* 142.

Armeniaca, A. L. de Jussieu, *Gen.* 341. — Meisner, *Gen.* 102.

Amygdalophora, Necker, *Elem. Bot.* ii. 70.

Trichocarpus, Necker, *Elem. Bot.* ii. 70.

Prunophora, Necker, *Elem. Bot.* ii. 71.

Cerasophora, Necker, *Elem. Bot.* ii. 71.

Chimanthus, Rafinesque, *Fl. Ludovic.* 26.

Persica, Meisner, *Gen.* 102.

Ceraseidos, Siebold & Zuccarini, *Abhand. Akad. Münch.* iii. 743.

Amygdalopsis, Roemer, *Fam. Nat. Syn.* iii. 15.

Laurocerasus, Roemer, *Fam. Nat. Syn.* iii. 89

Microcerasus, Roemer, *Fam. Nat. Syn.* iii. 93.

Emplectocladus, Torrey, *Smithsonian Contrib.* vi. 10, t. 5 (*Pl. Fremont.*).

Tubopadus, Pomel, *Mat. pour la Flore Atlant.* 8.

Trees or shrubs, with bitter and astringent properties, and scaly buds with scales imbricated in many rows, those of the inner rows accrescent and often colored. Leaves conduplicate or convolute in vernation, alternate, simple, usually serrate, petiolate, deciduous or persistent; stipules free from the petiole, usually lanceolate and glandular, often minute, deciduous. Flowers solitary or in fascicled corymbs or racemes, appearing from separate buds before, coetaneous with, or later than, the leaves, or on leafy branches. Calyx five-lobed, ebracteolate, the tube obconic, urseolate, or tubular, deciduous or rarely persistent. Disk thin, adnate to the calyx-tube, glandular, often colored. Petals white or rose-colored, inserted in the mouth of the calyx-tube on the margin of the disk, deciduous or rarely wanting. Stamens usually fifteen to twenty, inserted with the petals in three rows, those of the outer row ten, parapetalous, those of the next row opposite the sepals and alternate with those of the inner row; or sometimes thirty in three rows; filaments filiform, free, incurved in the bud; anthers oval, attached on the back, introrse, two-celled, the cells opening longitudinally. Gynœcium unicarpellate, or rarely composed of two or more carpels, rarely suppressed by abortion; ovary inserted in the bottom of the calyx-tube, one-celled; style terminal, dilated at the apex into a truncate stigma; ovules two, suspended, collateral, anatropous; raphe ventral, the micropyle superior. Fruit drupaceous; epicarp membranaceous, often glaucous or velutinous; mesocarp pulpy, or dry and coriaceous and two-valved; putamen bony, smooth, rugose, or foraminulose, compressed, indehiscent, one or rarely two-seeded. Seed suspended; testa thin, membranaceous; albumen thin, or usually wanting. Cotyledons thick and fleshy; the radicle superior.[1]

[1] The genus Prunus may be divided into the following sections, which by many authors have been considered genera: —

AMYGDALUS (including Amygdalophora, Trichocarpus, Persica, and Amygdalopsis). Flowers solitary or geminate, subsessile, often precocious. Fruit velutinous or rarely smooth; the flesh dry and membranaceous and splitting irregularly, or thick and succulent; the stone compressed, generally thick-walled, rugose and deeply pitted. Leaves conduplicate in vernation.

EMPLECTOCLADUS. Flowers solitary or geminate, short-pedicellate, appearing with the leaves. Fruit velutinous, with thin dry flesh, and a smooth or slightly rugose stone. Leaves conduplicate in vernation.

ARMENIACA. Flowers solitary or geminate, subsessile or short-pedicellate, precocious. Fruit pubescent, or in cultivation rarely smooth, with succulent flesh, and a thick-walled conspicuously wing-margined smooth or pitted stone. Leaves convolute in vernation.

PRUNUS (including Prunophora). Flowers pedicellate in fascicled umbels, precocious or coetaneous with the leaves. Fruit more or

Of the genus Prunus, now extended to include the Plums, Almonds, Peaches, Apricots, and Cherries, about one hundred and twenty species are distinguished. They are generally distributed over the temperate regions of the Northern Hemisphere, especially in eastern Asia,[1] in western and central Asia,[2] Europe,[3] and North America.[4] The genus is represented in tropical America by numerous species,[5] and occurs in southern Asia.[6] It has no representative in tropical and southern Africa, in Australia, Polynesia, or the southern countries of South America. In North America the genus is spread from the shores of the Atlantic to those of the Pacific, and from near the northern limits of tree-growth to southern Mexico. The territory of the United States contains at least twenty-five indigenous species, of which fourteen attain arborescent habit, and one is a large and important forest tree.[7]

less succulent, often covered with a glaucous bloom; stone compressed, smooth or slightly rugose, acute-margined along the ventral suture, grooved on the other. Leaves conduplicate or convolute in vernation.

CERASUS (including Cerasophora, Ceraseidos, and Microcerasus). Flowers pedicellate, fascicled, or corymbose, precocious or coetaneous with the leaves. Fruit smooth or rarely pilose, with succulent flesh; stone smooth or slightly rugose, ridged on the ventral suture. Leaves conduplicate in vernation.

PADUS. Flowers in slender terminal racemes, on lateral leafy or leafless branches of the year. Fruit subglobose, smooth, with succulent flesh; stone turgid, ovate or obovate, thick-margined on the ventral suture. Leaves conduplicate in vernation.

LAUROCERASUS. Flowers in racemes from the axils of the leaves of the previous year. Fruit smooth or rarely covered with a waxy bloom; flesh usually thin and subsucculent; stone smooth, rugose, or conspicuously reticulate-veined, obscurely margined on the ventral suture. Leaves conduplicate in vernation.

[1] Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xxix. 74 (*Mél. Biol.* xi. 657). — Franchet, *Pl. David.* i. 103; *Pl. Delavayanæ*, i. 194.

[2] Boissier, *Fl. Orient.* ii. 640. — Aitchison, *Jour. Linn. Soc.* xviii. 50. — Franchet, *Pl. du Turkestan*, 57.

[3] Nyman, *Conspect. Fl. Europ.* 212.

[4] Torrey & Gray, *Fl. N. Am.* i. 406. — Chapman, *Fl.* 119. — Brewer & Watson, *Bot. Cal.* i. 166. — Watson & Coulter, *Gray's Man.* ed. 6, 151. — Coulter, *Contrib. U. S. Nat. Herb.* i. 102 (*Man. Pl. W. Texas*).

[5] Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 241, 243, t. 563, 564. — Kunth, *Syn. Pl. Æquin.* iii. 480. — Grisebach, *Fl. Brit. W. Ind.* 231. — Hooker f. *Martius Fl. Brasil.* xiv. pt. ii. 55. — Hemsley, *Bot. Biol. Am. Cent.* i. 367.

[6] Miquel, *Fl. Ind. Bat.* i. pt. i. 363. — Brandis, *Forest Fl. Brit. Ind.* 190. — Hooker f. *Fl. Brit. Ind.* ii. 312.

[7] Of the sections of the genus, Amygdalus is confined to eastern Asia, which is believed to be the home of the tree from which the cultivated Peach (*Prunus Persica*, Bentham & Hooker, *Gen.* i. 609) has been derived (A. de Candolle, *Origine des Plantes Cultivées*, 176. — Bretschneider, *On the Study and Value of Chinese Botanical Works*, 10), and to southeastern Asia, where many species are found, particularly in Persia, Arabia, the Transcaucasian provinces, and Turkestan. *Prunus Amygdalus*, the origin of the cultivated Almond, was believed by Boissier (*Fl. Orient.* ii. 642) to grow on the Anti-Lebanon, in Turkestan and Mesopotamia, and on some of the mountain ranges of Persia. By cultivation this tree has spread through the Mediterranean basin, and now grows spontaneously in many of the southern countries of Europe and in northern Africa, where perhaps it is really indigenous (Cosson, *Ann. Sci. Nat.* xix. 429. — A. de Candolle, *Géographie Botanique*, ii. 887).

Emplectocladus is confined to the dry interior regions of Pacific North America, where two small shrubby species are recognized (Gray, *Proc. Am. Acad.* x. 70).

Armeniaca is Asiatic; two species are now recognized. *Prunus Armeniaca*, Linnæus (*Spec.* 474), the Apricot, is probably a native of northern China and Mongolia, whence it was carried into northern India, Persia, Armenia, and other countries of southwestern Asia, where it has long been naturalized (A. de Candolle, *Origine des Plantes Cultivées*, 171). The second species, *Prunus Mume* (Siebold & Zuccarini, *Fl. Jap.* i. 29, t. 11), is a native of Japan.

Prunus, the true Plum, of which about twenty species are distinguished, is generally distributed in the temperate regions of North America and eastern and western Asia. The native country of *Prunus domestica*, Linnæus (*Spec.* 475), the original of many of the races of the cultivated Plums of the Old World and the most important species of this section of the genus, is still undetermined. Many authors believe that it is a native of Anatolia and northern Persia, and that it was brought into Europe, where it is now widely naturalized, not more than two thousand years ago (A. de Candolle, *l. c.*). It has been cultivated in northern China and Japan from immemorial times, and now grows spontaneously on the mountains near Pekin and on those of Shensi and Kansuh (Bretschneider, *Early European Researches into the Flora of China*, 149. — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 218).

Cerasus belongs to the cold and temperate parts of North America, Europe, and Asia; nearly forty species are now recognized, of which a larger number grow in China and Japan than in any other geographico-botanical region. The two most important species are *Prunus Avium*, Linnæus (*Fl. Svec.* ed. 2, 165), and *Prunus Cerasus*, Linnæus (*Spec.* 474), from which are derived the two races of garden Cherries (A. de Candolle, *l. c.* 163). The former, believed to be a native of the region bordering on the Caspian, has become naturalized and now grows spontaneously in southern Europe as far north at least as central France. The latter inhabits the forests of northern Persia, Armenia, and the Caucasus; it grows in Algiers, and in Europe is distributed through southern Russia and the mountainous regions of Greece, Italy, and Spain to Scandinavia; it has become naturalized in northern India (Hooker f. *Fl. Brit. Ind.* ii. 313) and Madeira (Lowe, *Man. Fl. Mad.* 235), and occasionally in the eastern part of the United States (Darlington, *Fl. Cestr.* ed. 3, 73).

Padus, with twelve or fourteen species, occurs in the temperate and subtemperate regions of the two hemispheres, with its centre of distribution in China and Japan. The type of this section, *Prunus Padus*, Linnæus (*Spec.* 473), is the most widely distributed of the genus, growing naturally in nearly every part of northern and central Europe, and through Siberia, Manchuria, northern China, Mongolia, and northern India.

Laurocerasus, with about twenty species, is the most generally distributed group of the genus. The largest number of the species occur in the Indian Archipelago and in tropical America; the

Few genera of plants are more useful to man. Many of the species contain in the seeds and leaves considerable quantities of hydrocyanic acid, to which is due their peculiar odor.[1] Some bear delicious fruits, which, fresh and dried, are important articles of human food, and others, especially the Almond, produce valuable seeds.[2] The dried fruit of the Old World Plum has laxative

others are found in southern China, Japan, India, and the Caucasian provinces, in southwestern Europe and the north Atlantic African islands, and in the southern part of the United States, California, and Mexico.

[1] Baillon, *Hist. Pl.* i. 453. — Le Maout & Decaisne, *Traité Gén. Bot.* English ed. 388. The leaves and young branches of some species of Laurocerasus at the period of active vegetation contain such quantities of hydrocyanic acid as to be dangerous to animals browsing on them. A city ordinance of Mobile prohibits throwing the trimmings of *Prunus Caroliniana*, a favorite hedge plant in that city, into the streets where they might be eaten by cattle.

[2] More than three hundred varieties of plums are now recognized in the collections of Europe, where this tree has been cultivated from the time of the ancients. The origin of the different races of the cultivated Old World Plums is obscure ; they are now generally supposed to have been derived from the crossing of different species, particularly *Prunus domestica* and *Prunus insititia*, Linnæus (*Spec.* ed. 2, i. 680), or of the different varieties of the former which many authorities have considered species (Lucas, *Einleitung in das Studium der Pomologie*, Introduction. — Decaisne, *Le Jardin Fruitier*, viii. *Prunier*, 11). The cultivation of the Plum on a large scale is principally confined to the valley of the Loire and to the department of Lot-et-Garonne in France, to central Germany, and to Bosnia, Servia, Croatia, and California. In the valley of the Loire, which is one of the great sources of supply of the ordinary prunes of commerce, the variety principally grown is the Prunier de St. Julien (*Prunus domestica*, var. *Juliana*, De Candolle, *Prodr.* ii. 534). The best French prunes are produced in the regions lying about the town of Clariac in the valley of the Lot, from a variety known as Prunier d'Ente, which has been grown for at least a century in this region, where the cultivation of the trees and the harvesting and drying of the fruit is managed with the greatest care and skill. (For accounts of the production of prunes in France, see *U. S. Consular Reports*, Sept. 1888, 444. — *Kew Bull. Miscellaneous Information*, Dec. 1890, 263.) The German prunes are principally the product of a tree considered by De Candolle to be a variety of *Prunus domestica* (var. *Pruneauliana*, *l. c.* 534), and by Koch (*Dendr.* i. 94) a species, *Prunus œconomica* of Borkhausen (*Handb. Forstbot.* ii. 1401).

The Possavina district of northern Bosnia is now the most important prune-producing region of southeastern Europe, the best fruit being grown on the sides of the hills descending into the plains of Possavina. The methods of cultivating and drying the fruit are rude and primitive, and the product is inferior to the best French and German prunes. The prunes grown in Bosnia and Servia are, however, largely exported to the United States, Germany, and Hungary (Spons, *Encyclopædia of the Industrial Arts, Manufactures, and Raw Commercial Products*, i. 1027. — *Kew Bull. Miscellaneous Information*, *l. c.* 264).

The Apricot, which has been cultivated in Europe since the beginning of the Christian era, is now grown in most temperate countries, especially in France, Italy, southern Germany, India, and California ; in some parts of India, where it flourishes in all the Himalayan region, as well as in Thibet and Afghanistan, the Apricot-trees constitute the chief wealth of the inhabitants, the dried fruit being an important article of trade (Jacquemont, *Voyage*, ii. 211, 434. — Brandis, *Forest Fl. Brit. Ind.* 191. — Hooker f. *Fl. Brit. Ind.* ii. 313. — Balfour, *Cyclopædia of India*, ed. 3, iii. 299). The Apricot is commonly cultivated in northern China, where the seeds are used in the place of almonds (Bretschneider, *On the Study and Value of Chinese Botanical Works*, 10 ; *Early European Researches into the Flora of China*, 149. — Franchet, *Pl. David.* i. 104). In Japan the Apricot is occasionally cultivated, although the climate does not appear to suit it. The Japanese species, *Prunus Mume*, produces a small hard sour fruit which is sometimes eaten salted or dried, and is made into vinegar (Rein, *Japan nach Reisen und Studien im Auftrage der Königlich Preussischen Regierung*, ii. 102).

The Almond is the most important plant of the genus. Bitter and sweet almonds are produced from trees which botanists regard as varieties of one species, and which have been cultivated in the Orient from very early times. (M. Porcius Cato, *De Re Rustica*, cap. 8. — Harris, *Nat. Hist. Bible*, 6.) In the beginning of the fourteenth century almonds had become an important article of commerce in Venice, and their consumption in mediæval Europe was enormous. Sweet almonds are produced in great quantities in Italy, Portugal, the Canary Islands, and the countries which surround the Gulf of Persia (Spons, *l. c.* i. 1022), and in California, where the cultivation of the Almond has recently assumed importance (Wickson, *The California Fruits and How to Grow Them*, ed. 2, 512. — C. H. Shinn, *Garden and Forest*, iv. 495) ; the best are now raised in Spain, and are known as the Jordan almonds. Bitter almonds are grown principally in the regions bordering on the Mediterranean, the best being produced in France and Sicily.

The chief value of the Almond is in the oil which is pressed from the seeds ; it is of two kinds, a fixed or fatty oil, and a volatile oil. The first is obtained from the fresh fruit of the bitter and of the sweet almond, and is manufactured in southern France, Italy, and Spain, the best quality being made in Majorca. The bitter almonds are first peeled in order to free them of the essential or volatile oil, and are then crushed ; the sweet almonds are crushed without peeling, and the oil is then pressed from the crushed seeds. It is of a clear yellow color and possesses an agreeable flavor, and is principally used by perfumers and, purified of its hydrocyanic acid, in medicine (Flückiger & Hanbury, *Pharmacographia*, 216, 219. — Spons, *l. c.* ii. 1377, 1416).

The Peach has been cultivated in northern China from time immemorial ; it is also commonly grown in Mongolia and Cochin China (Loureiro, *Fl. Cochin.* 315), in Japan, where it is the most abundant of the stone-fruits (Rein, *l. c.* 101), in northern India, and in central and western Europe, where it appears to have been brought from Persia at the beginning of the Christian era (Brandis, *Forest Fl. Brit. Ind.* 191. — Balfour, *l. c.* 166). It flourishes in the southern and central portions of North America ; and in some parts of the middle Atlantic and Pacific states the cultivation of the Peach is an important agricultural industry (Wickson, *l. c.* 293).

The Cherry, as a cultivated fruit-tree, has been known in Europe for at least two centuries, and innumerable varieties have been raised there and in the United States. These are of two races, the Bigarreau and Heart Cherries, with large, sweet, or slightly bitter fruit, derived from *Prunus Avium*, and the Morello and Duke Cherries, with smaller and often astringent fruit, derived from

properties; and the bark of many species is bitter and astringent and has been used, particularly that of the North American *Prunus Virginiana* and *Prunus serotina* and of the Old World *Prunus Padus*,[1] in medicine.[2] The aromatic leaves of the Caucasian *Prunus Laurocerasus*[3] generate by distillation a volatile oil, and are used in making Cherry-cordial water.[4] The flowers of the Peach are sometimes used in Europe and the United States as a mild purgative;[5] in China they are considered laxative and sedative and serve as a vermifuge; in the same country the seeds are employed in the treatment of many diseases, and vinegar was formerly made from the pulp.[6] The flowers of the Blackthorn or Sloe, *Prunus spinosa*,[7] are purgative, and the fruit, which is astringent and austere until mellowed by frost, is sometimes used in medicine for its refrigerant and styptic properties.[8] The seeds of *Prunus Mahaleb*,[9] a native of the Caucasian provinces, and now naturalized in southern Europe and sparingly in some parts of eastern North America, possess an agreeable flavor; and the oil pressed from them is used in perfumery,[10] and is valued by the Arabs as a cure against calculus of the bladder.[11] Cordials or ratafias are made by steeping in spirits the fruit of Plums, Cherries, and Peaches, or the seeds of the Bitter Almond, the Cherry, and the Apricot; from the fruit of the European wild Cherry, *Prunus Avium*, kirschwasser and maraschino[12] are prepared, and from that of the European Plums, zwetschenwasser and raki.[13] A limpid oil is obtained from the seeds of various species of Prunus in Europe and India;[14] and Plum-trees, the European Cherries, the Peach, the Apricot, and the Almond secrete from their trunks and branches a gum which was once employed in medicine, and is now used in France in various industrial processes.[15]

Prunus Cerasus. The origin, however, of many of the varieties of cultivated Cherries is obscure, as species, subspecies, and varieties have crossed and recrossed in their production.

[1] Linnæus, *Spec.* 473. — Koch, *Dendr.* i. 120. — Brandis, *Forest Fl. Brit. Ind.* 194. — Hooker f. *Fl. Brit. Ind.* ii. 315. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xxix. 108 (*Mél. Biol.* xi. 705).

Cerasus Padus, De Candolle, *Fl. Franc.* ed. 3, iv. 480; *Prodr.* ii. 539. — *Nouveau Duhamel*, v. 2, t. 1. — Boissier, *Fl. Orient.* ii. 650.

[2] B. S. Barton, *Coll.* ed. 3, i. 11. — A. Richard, *Hist. Nat. Med.* ed. 3, iii. 632. — Endlicher, *Enchirid.* 663. — Rosenthal, *Syn. Pl. Diaphor.* 978. — Porcher, *Resources of Southern Fields and Forests*, 169. — Guibourt, *Hist. Drog.* ed. 7, iii. 317. — Baillon, *Hist. Pl.* i. 454. — *U. S. Dispens.* ed. 14, 749. — Stillé & Maisch, *Nat. Dispens.* ed. 2, 1177. — Flückiger & Hanbury, *Pharmacographia*, 223.

[3] Linnæus, *Spec.* 474. — Koch, *Dendr.* i. 125.

Cerasus Laurocerasus, Loiseleur, *Nouveau Duhamel*, v. 6. — De Candolle, *Prodr.* ii. 540. — Boissier, *Fl. Orient.* ii. 650.

[4] Lindley, *Fl. Med.* 232. — A. Richard, *l. c.* 632. — Rosenthal, *l. c.* — Baillon, *l. c.* 453. — Flückiger & Hanbury, *l. c.* 226. — Guibourt, *l. c.* 318, f. 678. — Jackson, *Commercial Botany of the 19th Century*, 81.

[5] Guibourt, *l. c.* 314.

[6] Smith, *Contrib. Mat. Med. China*, 168.

[7] Linnæus, *l. c.* 475. — De Candolle, *Prodr.* ii. 532. — Guimpel, Willdenow & Hayne, *Abbild. Deutsch. Holz.* i. 87, t. 66. — Koch, *Dendr.* i. 98.

[8] Linnæus, *Mat. Med.* 79. — Woodville, *Med. Bot.* ii. 233, t. 84. From the green fruit of the Sloe, a strong astringent extract, known as *acacia nostras*, was formerly made in Germany (A. Richard, *l. c.* 630).

[9] Linnæus, *Spec.* 474. — Jacquin, *Fl. Austr.* iii. 15, t. 227. — Koch, *l. c.* 116.

Cerasus Mahaleb, Loiseleur, *Nouveau Duhamel*, v. 6, t. 2. — De Candolle, *l. c.* 539.

[10] Loudon, *Arb. Brit.* ii. 708.

[11] Le Maout & Decaisne, *Traité Gén. Bot.* English ed. 388. — Guibourt, *l. c.* 316.

[12] Kirschwasser is principally produced in the valley of the Rhine in Germany, France, and Switzerland. A wild black-fruited variety of *Prunus Avium* (var. *macrocarpa*, De Candolle, *Prodr.* ii. 535) is thought to produce the best quality, which is made from carefully selected ripe fruit; this is crushed over wicker strainers that separate the pulp and stones from the juice, which is allowed to flow into large tubs; the stones are then collected and added to the juice which is fermented in tightly covered vats, and at the end of four or five days is drawn off and distilled. Kirschwasser of an inferior quality is made from cherries shaken from the trees and thrown into open hogsheads, in which the ripe, half ripe, and rotten fruit is all crushed together and allowed to ferment. At the end of twenty or thirty days, when fermentation is complete, the whole mass is distilled over an open fire. Made in this way, kirschwasser has a strong and disagreeable flavor, due to the mould developed during the process of fermentation.

Maraschino is made from the Marasca Cherry, a variety of *Prunus Avium* with small acid fruit (*Nouveau Duhamel*, v. 21), by a process similar to that by which kirschwasser is prepared, except that honey or sugar is added to the liquor after it is distilled. Maraschino is principally manufactured in Dalmatia, that made in the neighborhood of Zara being considered the best (Loudon, *l. c.* 697. — Spons, *Encyclopædia of the Industrial Arts, Manufactures, and Raw Commercial Products*, i. 224).

[13] Loudon, *l. c.* 690.

[14] Le Maout & Decaisne, *l. c.* 388.

In India, oil pressed from the seeds of the Apricot and the Peach is used for illuminating, in cookery, and on the human hair (Brandis, *l. c.* 192. — Balfour, *Cyclopædia of India*, ed. 3, iii. 166). Cherry-oil is now manufactured in England from the seeds of *Prunus serotina*, imported from the United States (Spons, *l. c.*).

[15] See Trécul, *Maladie de la gomme chez les Cerisiers, les Pruniers, les Abricotiers, et les Amandiers, Compt. Rend. Acad. Sci.* li. 624; *Produit de la gomme chez le Cerisier, le Prunier, l'Amandier, l'Abricotier et le Pêcher, Mém. Inst.* xxx. 241.

The gum which exudes from the bark of Prunus, known generally as Cherry-gum, is only partially soluble in water, with which it

The wood of Prunus is close-grained, solid, and durable, and is usually light brown, more or less tinged with red. The most valuable timber tree of the genus is the North American *Prunus serotina*. The wood of *Prunus domestica* and of *Prunus Avium* is much esteemed in Europe by makers of furniture and musical instruments, and by turners.[1] The wood of *Prunus Mahaleb* is hard, dark-colored, and fragrant; known in France as bois de St. Lucie, it is valued by cabinet-makers, and is employed in the manufacture of tobacco pipes and of many small articles.[2] The spiny stems of *Prunus spinosa* are used for canes, and for the handles of agricultural implements and other tools.[3] In India the wood of the Peach-tree is utilized in building, and that of the Apricot for many domestic purposes;[4] and in Japan the wood of *Prunus Pseudo-Cerasus*[5] and of *Prunus Mume* for engraving and for the blocks used in printing cloth and wall-paper.[6]

Prunus contains many plants valued in gardens for the beauty of their flowers and foliage. Various forms of the Cherry, the Peach, and the Plum, with double flowers, or of abnormal habit, have long been cultivated. The parks and gardens of temperate Europe are enlivened by the evergreen foliage of *Prunus Laurocerasus*, the so-called English Laurel, a native of the Orient, and of *Prunus Lusitanica*,[7] the Portugal Laurel, which are replaced in those of the southern part of the United States by *Prunus Caroliniana;* in Japan *Prunus Mume* and *Prunus Pseudo-Cerasus* hold the first place among flowering plants in the affections of the people, and no Japanese home is without them. The first, when its leafless branches are covered with white or red flowers, announces the arrival of spring and a time of rejoicing, while the blossoms of the second invite the people to another festival.[8]

Numerous insects[9] prey upon the different species of Prunus, which are also subject to serious fungal diseases.[10]

makes a thick mucilage, the insoluble portion, to which the name of *Cerisin* is given, merely swelling in water. It is brittle, with an insipid, sweet, or astringent flavor, and is at first liquid and colorless, but with exposure to the air hardens and grows darker; in commerce Cherry-gum appears in the form of large, irregular shaped pieces, and is lustrous and transparent, varying in color from pale yellow to brown, that produced by the Cherry-tree being of a darker color than the gum of the Plum-tree. *Cerisin* is colorless, transparent, odorless, and tasteless (Henry Watts, *Dictionary of Chemistry.* — Spons, *Encyclopædia of the Industrial Arts, Manufactures, and Raw Commercial Products*, ii. 1638. — Guibourt, *Hist. Drog.* ed. 7, iii. 318).

[1] Loudon, *Arb. Brit.* ii. 698. — Matthieu, *Fl. Forestière*, ed. 3, 125, 129.

[2] Loudon, *l. c.* 708. — Brandis, *Forest Fl. Brit. Ind.* 195. — Matthieu, *l. c.* 127.

[3] The common Blackthorn canes of northern Europe are cut from the stems of *Prunus spinosa.* — Loudon, *l. c.* 686. — Matthieu, *l. c.* 130.

[4] Brandis, *l. c.* 191.

[5] Lindley, *Trans. Hort. Soc. Lond.* vi. 90.

[6] Rein, *Japan nach Reisen und Studien im Auftrage der Königlich Preussischen Regierung*, 297.

[7] Linnæus, *Spec.* 473. — Koch, *Dendr.* i. 124.

Cerasus Lusitanica, Loiseleur, *Nouveau Duhamel*, v. 5. — Lowe, *Fl. Mad.* 236.

[8] Rein, *l. c.* 319. — Conder, *The Flowers of Japan and the Art of Floral Arrangement.*

[9] The North American species of Prunus furnish food to a large number of insects, some of which have become injurious to the cultivated fruit-trees of this genus. The original food-plant of the Peach-tree Borer (*Ægeria exitiosa*, Say) is believed to have been *Prunus serotina*, which is sometimes attacked by this insect; and a number of beetles are known as borers in the wood of the different species. *Dicerca divaricata* (Say) attacks the trunks of the Wild Cherry, and the Flat-headed Apple-tree Borer (*Chrysobothris femorata*, Fabricius) those of the Wild Plum; and another borer, *Cyrtophorus verrucosus*, Olivier, is found in the wood of *Prunus serotina*, and of *Prunus Pennsylvanica.*

The number of insects which prey upon the foliage of Prunus is very large. Packard (*5th Rep. U. S. Entomolog. Comm.* 1886–1890) records sixty-eight species as feeding on the Wild Plums and the Wild Cherries of eastern America; but this list probably represents only a small proportion of the insects which feed on the foliage of trees of this genus in North America, as little is known of those that attack the western and southern species. The Tent-caterpillars (Clisiocampa), are particularly partial to the native Plums and Cherries, and in those parts of the country where these trees are plentiful, they are considered a menace to neighboring orchards by their harboring these pests. The Canker-worms and the Fall Web-worms also feed on the trees of this genus. Larvæ of *Platysamia Cecropia* (Linnæus) and other large moths of the Silk-worm family are found on the Plum and the Cherry; and the caterpillars of *Sphinx drupiferarum*, Abbot & Smith, occasionally defoliate their branches (Saunders, *Insects Injurious to Fruits*, 162). The leaves also are affected by several species of leaf-moths.

The Cherry-slug (*Selandia Cerasi*, Peck) and one or two other Saw-flies feed on the Wild Cherry. A small Curculio (*Anthonomus quadrigibbus*, Say) is often abundant in the seeds of *Prunus serotina.* The fruit of the Wild Plum is destroyed by the Plum-curculio (*Conotrachelus Nenuphar*, [Herbst]), whose ravages seriously interfere with the cultivation in the United States of the European and native plums.

The Plum-tree has been found to be the food-plant of the Hop-aphis (*Phorodon Humuli*, Schrank) during certain periods of the year, and the destruction of Plum-trees in the vicinity of Hop-fields is recommended by C. V. Riley (*Insect Life*, i. 133).

[10] The number of described species of fungi which infest arbores-

Prunus, the classical name of the Plum-tree, was adopted by Linnæus for a section of the genus as now extended.

cent *Rosaceæ* is very great, and as the fruit-trees of the temperate zones belong to this family, they have been more carefully studied than those affecting any other family, with the exception of *Vitaceæ*. Of the fungi which attack the North American species of Prunus, one of the most striking is *Plowrightia morbosa*, Saccardo (*Sphæria morbosa*, Schweinitz), which produces the warty excrescences known as Black Knot. These were formerly supposed to be due to the attacks of insects, but their fungal nature is now known (Farlow, *Bull. Bussey Inst.* i. 440, t. 4, 5, 6). *Plowrightia morbosa* is peculiar to North America, and is found on *Prunus Americana*, *Prunus nigra*, *Prunus hortulana*, *Prunus angustifolia*, *Prunus maritima*, *Prunus subcordata*, *Prunus Pennsylvanica*, *Prunus serotina*, and *Prunus Virginiana*. The ugly black knots which often cover the branches of these plants are familiar; there are two forms of fructification, one called the conidial stage found in early summer when the surface of the knots is dark green, and the other ripening in midwinter or early spring when the knots begin to break up. Horticulturally considered, the Black Knot is a serious pest, as it passes from our native species of Prunus to the cultivated Plums and Cherries of Old World origin. The cultivation of Plums has been abandoned in some of the eastern states, owing to the ravages of this fungus; and in some parts of the country, varieties of cultivated Cherries are also badly diseased. The disease has been known for many years in the eastern states, but has not developed on the cultivated Plums and Cherries of California, although, as the fungus is endemic on the native species of the Pacific coast, it may be expected to spread sooner or later to the fruit-growing regions of the coast. In Europe no native disease corresponds to Black Knot, which has not yet been imported from America.

Next in seriousness among the diseases which affect our species of Prunus are the prominent deformities caused by species of Taphrina, which produce Leaf-curl. The most striking of these is *Taphrina deformans*, Tulasne, which causes the leaves of Peach-trees to become thickened, curled, and wrinkled, doing, however, less real injury than the disease called The Yellows, the origin of which is not yet satisfactorily determined. The plant which by some authorities is considered a variety of *Taphrina deformans* (var. *Wiesneri*, Rathay) is occasionally seen on *Prunus serotina*, although the exact determination of the species is not beyond question. A similar disease, *Taphrina Pruni*, Tulasne, causes the distortion known as Plum-pockets on cultivated Plums, and on the fruits of our native *Prunus serotina* and *Prunus maritima*, and of a few other species. The pockets are best seen in the cultivated Plums, which are attacked in early summer soon after the fruit sets; the young ovaries swell, often almost to the size of full-grown plums, by the latter part of June, when they are hollow with the exception of a few fibrous bands, and are white and powdery. Similar, although smaller, pockets are sometimes found on wild Plum-trees, and it is probable that the disease is a native of America as well as of Europe, where it is common. It should not be confounded with *Monilia fructigena*, Persoon, a mould-like fungus which attacks cherries, plums, and peaches as they ripen, covering them with a grayish powder without, however, causing them to become hollow.

The leaves of the different species of Prunus are attacked by a number of small fungi, some of which are destructive. The Rust, *Puccinia Pruni-spinosæ*, Persoon, causes small yellow or brownish yellow spots to appear on the under surface, with accompanying purplish-red spots on the upper surface, of the leaves of *Prunus serotina*, *Prunus Virginiana*, and other species, as well as on those of the Peach and the Almond. In the southern states, especially, this Rust is common on Peach-trees, and is often accompanied by a thin white mould (*Cercosporella Persica*, Saccardo).

The Mildew, *Podosphæra Oxyacanthæ*, De Bary, is widely distributed in Europe and America on wild and cultivated species of Prunus, as well as on various species of *Pomeæ*. Other fungi which attack North American species of Prunus are *Septoria cerasina*, Berkeley & Ravenel, which forms destructive small black spots on the leaves; *Monilia Linhartiana*, Magnus, which covers the leaves of *Prunus Virginiana* with a web-like mould, causing them to dry and fall; the curious *Cornularia Persicæ*, Saccardo, which forms small black club-shaped bunches on the bark of Peach-trees; and the cinnabar-colored Punk-fungus, *Polyporus cinnabarinus*, Fries, common on the native Wild Cherries used for fencing.

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

PRUNUS. Flowers in fascicled umbels; fruit often slightly two-lobed by a ventral groove; leaves conduplicate or convolute in vernation.

Leaves conduplicate in vernation.

Fruit red or orange-colored, destitute of bloom.

Calyx-lobes glandular-serrate, glabrous on the inner surface; stone compressed; leaves broadly oblong-ovate to obovate; petioles biglandular . . . . . 1. P. NIGRA.

Calyx-lobes entire, pubescent on the inner surface; stone turgid; leaves oval or slightly obovate; petioles usually eglandular . . . . . 2. P. AMERICANA.

Calyx-lobes glandular-serrate, pubescent on the two surfaces; stone turgid, compressed at the two ends; leaves ovate-lanceolate, acute; petioles glandular . 3. P. HORTULANA.

Calyx-lobes glandular-ciliate, glabrous; stone turgid; leaves lanceolate to oblong-lanceolate; petioles biglandular . . . . . 4. P. ANGUSTIFOLIA

Fruit blue, covered with a glaucous bloom.

Calyx-lobes entire, puberulous on the outer, tomentose on the inner surface; stone turgid, acute at the two ends; leaves lanceolate to oblong-ovate; petioles eglandular . . . . . 5. P. ALLEGHANIENSIS.

Leaves convolute in vernation.

Fruit red or yellow, nearly destitute of bloom.

Calyx-lobes pubescent or puberulous, with ciliate margins; stone flattened or turgid, pointed at the two ends; leaves broadly ovate to orbicular; petioles eglandular . . . . . 6. P. SUBCORDATA.

Fruit dark blue or black, covered with a glaucous bloom.

Calyx-lobes entire, glabrous or puberulous on the outer, tomentose on the inner surface; stone slightly compressed, acute at the two ends; leaves ovate-lanceolate to oblong; petioles eglandular . . . . . 7. P. UMBELLATA.

CERASUS. Flowers fascicled or corymbose; fruit globular; leaves conduplicate in vernation.

Calyx-lobes obtuse, entire; stone oblong-globular; leaves oblong-lanceolate; petioles glandular . . . . . 8. P. PENNSYLVANICA.

Calyx-lobes rounded or sometimes emarginate at the apex; stone ovoid, acute at the two ends; leaves oblong-obovate to oblanceolate . . . . . 9. P. EMARGINATA.

PADUS. Flowers racemose on leafy branches of the year; fruit globular; stone cylindrical; leaves conduplicate in vernation.

Calyx-lobes deciduous; stone oblong-ovate, pointed at the apex; leaves broadly oval or oblong-obovate, usually abruptly acuminate . . . . . 10. P. VIRGINIANA.

Calyx-lobes persistent on the ripe fruit; stone oblong-obovate; leaves oblong or lanceolate-oblong, usually gradually acuminate . . . . . 11. P. SEROTINA.

LAUROCERASUS. Flowers racemose, from the axils of persistent leaves of the previous year; fruit globose or slightly two-lobed; leaves conduplicate in vernation.

Calyx-lobes rounded, with undulate margins; stone broadly ovate, cylindrical; leaves oblong-lanceolate, entire, or rarely remotely spinulose-serrate . . . . 12. P. CAROLINIANA.

Calyx-lobes acute, with laciniate margins; stone depressed-globose; leaves elliptical to oblong-ovate, entire . . . . . 13. P. SPHÆROCARPA.

Calyx-lobes acute, entire; stone ovate, slightly compressed; leaves ovate to lanceolate-acuminate, coarsely spinulose-toothed or rarely entire . . . . . 14. P. ILICIFOLIA.

PRUNUS NIGRA.

Red Plum. Canada Plum.

CALYX-LOBES glandular-serrate, glabrous on the inner surface. Stone compressed. Leaves broadly oblong-ovate to obovate; petioles biglandular.

Prunus nigra, Aiton, *Hort. Kew.* ii. 165. — Willdenow, *Spec.* ii. pt. ii. 993; *Enum.* 518; *Berl. Baumz.* ed. 2, 311. — Poiret, *Lam. Dict.* v. 674. — Persoon, *Syn.* ii. 35. — *Bot. Mag.* t. 1117. — Pursh, *Fl. Am. Sept.* i. 331. — Torrey, *Fl. U. S.* 469. — Sprengel, *Syst.* ii. 477. — Spach, *Hist. Vég.* i. 399. — Roemer, *Fam. Nat. Syn.* iii. 59.

Cerasus nigra, Loiseleur, *Nouveau Duhamel*, v. 32. — De Candolle, *Prodr.* ii. 538. — Hooker, *Fl. Bor.-Am.* i. 167. — Don, *Gen. Syst.* ii. 513. — Loudon, *Arb. Brit.* ii. 704 (in part), f. 411, 412.

Prunus mollis, Torrey, *Fl. U. S.* 470.

Prunus Americana, Torrey & Gray, *Fl. N. Am.* i. 407 (in part). —Nuttall, *Sylva*, ii. 19 (in part). — Torrey, *Fl. N. Y.* i. 194 (in part). — Provancher, *Flore Canadienne*, i. 162. — Koch, *Dendr.* i. 101 (in part). — Emerson, *Trees Mass.* ed. 2, ii. 511. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 65 (in part). — Watson & Coulter, *Gray's Man.* ed. 6, 151 (in part). — Gray, *Forest Trees N. Am.* t. 46.

A small tree, twenty or thirty feet in height, with a trunk sometimes five or six inches in diameter, dividing, usually five or six feet from the ground, into a number of stout upright branches, which form a narrow rigid head. The bark of the trunk is an eighth of an inch thick, and light gray-brown, with a smooth outer layer which exfoliates in large thick plates composed of several papery coats, and in falling exposes a darker slightly fissured scaly inner bark. The branches in their second year develop stout spiny lateral spur-like secondary branchlets, which are sometimes two inches in length and grow into leafy branches. The branchlets, when they first appear, are bright green, glabrous or puberulous; they are slightly zigzag and marked by numerous pale excrescences, and in their second year are dark brown tinged with red. The winter-buds are acuminate, an eighth to a quarter of an inch in length, and covered with chestnut-brown triangular scales with broad pale scarious margins. The leaves are oblong-ovate or obovate, abruptly contracted at the apex into long narrow points, wedge-shaped, truncate, or slightly heart-shaped at the base, and doubly crenulate-serrate with small dark glandular teeth; when they unfold they are faintly tinged with red, and are pubescent on the under surface, or are glabrous with the exception of conspicuous tufts of slender white or rufous hairs in the axils of the primary veins; at maturity they are membranaceous, rather opaque, light green on the upper, and pale on the lower surface, three to five inches long and one and a half to three inches broad, with conspicuous pale midribs and slender veins, and are borne on stout petioles from half an inch to an inch in length, and furnished near the apex with two large dark glands. The stipules are lanceolate or, on vigorous shoots, often three to five-lobed, glandular-serrate, half an inch in length, and early deciduous. The flowers, which are an inch and a quarter across when expanded, appear before the leaves, from the first of May in eastern New England to the end of the month at the north; they are proterandrous, and are produced in three or four-flowered umbels, with short thick peduncles conspicuously marked by the scars left by the falling of the bud-scales, which when fully grown are one third of an inch long, pale green tinged with pink, and usually persistent until the expansion of the flowers. These are borne on slender glabrous dark red pedicels which vary from one half to two thirds of an inch in length. The calyx-tube is broadly obconic, dark red on the outer, and bright red on the inner surface, with narrow acute glandular lobes, glabrous or occasionally pubescent on the outer surface, and reflexed after anthesis. The petals, which are white, turn pink in fading, and are broadly ovate, rounded at the apex, with more or less erose margins, and contracted at the base into short claws.

The fruit, which ripens between the middle and the end of August, is oblong-oval, and an inch to an inch and a quarter long, with a tough thick orange-red skin nearly destitute of bloom, and yellow rather austere flesh adhesive to the stone, which is nearly oval, compressed, an inch in length, two thirds of an inch in breadth, thick-walled, and acutely ridged along the ventral, and slightly grooved on the dorsal suture. The seed is ovate and compressed, with a thin brown testa and a short exserted radicle.

Prunus nigra is distributed from Newfoundland[1] through the valley of the St. Lawrence, and westward to the valleys of the Rainy and Assiniboine Rivers and the southern shores of Lake Manitoba.[2] It is found in the neighborhood of streams in rich alluvial soil, or grows on low limestone hills in open glades with Hawthorns and Viburnums, or along the borders of the forest.[3]

The wood of *Prunus nigra* is heavy, hard, strong, and close-grained; it is rich bright red-brown, with a lustrous surface and thin lighter colored sapwood, and contains many thin medullary rays. The specific gravity of the absolutely dry wood is 0.6918, a cubic foot weighing 43.17 pounds.

Jacques Cartier, on his second voyage to North America, landed in September, 1535, on the banks of the St. Lawrence, near the island of Orleans, which he named Isle de Bacchus, on account of the wild grapes which he found growing in the woods, and was there the first European to see the Canada Plum-tree;[4] its dried fruit he had already seen in the canoes of a tribe of Indians whom he had met during the previous season in the Bay of Chaleur.[5]

Prunus nigra was introduced into English gardens in 1773[6] by Lee & Kennedy,[7] nurserymen at Hammersmith near London; and the earliest botanical description was drawn up from the cultivated tree.

Prunus nigra is often planted in Canadian gardens, and occasionally in those of the northern states, for its fruit or for the beauty of its large slightly fragrant flowers.[8]

[1] Teste Hooker, *Fl. Bor.-Am.* i. 167.

[2] Richardson, *Arctic Searching Exped.* ii. 288. — Brunet, *Cat. Vég. Lig. Can.* 20. — Bell, *Rep. Geolog. Surv. Can.* 1867–69, Appendix, 8 (*Pl. Manitoulin Islands*); 1879–80, 54°. — Macoun, *Cat. Can. Pl.* i. 124.

The range of the Canada Plum has been much extended through cultivation, and it is now naturalized and grows spontaneously in the neighborhood of houses and along the borders of highways in northern New England and New York in the territory adjacent to the Canadian boundary, and in eastern Massachusetts. It is to be looked for growing indigenously in northern Minnesota, and is probably naturalized in Wisconsin and Iowa, and some of the varieties of cultivated Plum-trees which are believed to have been taken from the woods of these states can be traced to this species.

[3] Prof. D. P. Penhallow notices that the leaves of *Prunus nigra*, when it grows on limestone hills in the Province of Quebec, are pubescent on the lower surface, and that they are glabrous or puberulous when it grows on bottom-lands. *Prunus Americana* under similar conditions shows the same variations in the valley of the Mississippi River.

[4] "Pleine de moult beaux arbres de la nature et sorte de France: comme chesnes, ormes, fresnes, noyers, pruniers, ifs, cedres, vignes, aubépines qui portent fruit aussi gros que prunes de damas, et autres arbres." (*Voyages de Decouverte au Canada*, 2me Voyage, 34 [Literary and Historical Society of Quebec. Reprint].)

[5] "Ils ont aussi des prunes qu'ils sèchent comme nous faisons pour l'hiver, et les appellent Honesta." (*Idem.* 1er Voyage, 17. See also Hakluyt, *Voyages*, ed. Evans, iii. 258.)

[6] Aiton, *Hort. Kew.* ii. 165.

[7] James Lee (1715–1795); a native of Selkirk, Scotland, was employed in the gardens of Syon House, a seat of the Duke of Northumberland, and afterwards in those of the Duke of Argyll at Whitton; in 1760, in partnership with Louis Kennedy, he established a nursery at Hammersmith, which soon became famous and for many years was considered the most important in the world. Lee was a correspondent of Linnæus, who dedicated to him a genus of Old World tropical plants related to the Grape Vine (*Leea*); he was the author of an *Introduction to Botany*, arranged according to the Linnæan system, which passed through several editions and was long held in high repute, and in 1774 he published a catalogue of the plants and seeds grown in his garden.

Louis Kennedy (1775–1818) made many contributions to horticultural literature toward the end of the last century, and articles from his pen are found in the *Botanical Repository* (1799–1804). *Kennedya*, a genus of Australian leguminous plants, well known in gardens, was dedicated to him by the French botanist Ventenat.

Lee & Kennedy were exceedingly active and successful in introducing new plants, and maintained collectors in North and South America, and, in partnership with the empress Josephine, one in South Africa also. They first cultivated in England several North American plants, as well as the China Rose and *Fuchsia coccinea*, which was the first of its genus introduced into gardens.

[8] The fruit of *Prunus nigra* is sold in large quantities in Canadian markets; it is eaten raw or cooked, and is made into preserves and jellies. Like the fruit of all Plum-trees, it varies in size and shape, in the thickness and color of the skin, and in the flavor and juiciness of the flesh; and some attention has been paid in Canada to selecting the best wild varieties for cultivation. Varieties of this species are propagated and sold by nurserymen in some of the western states, and to it can be referred the well known Purple Yosemite, Quaker, and Weaver Plums.

EXPLANATION OF THE PLATE.

Plate CXLIX. Prunus nigra.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. Vertical section of a flower, enlarged.
4. A pistil, with a vertical section of the ovary removed, enlarged.
5. Cross section of an ovary, enlarged.
6. An ovule, much magnified.
7. A fruiting branch, natural size.
8. Cross section of a fruit, natural size.
9. Vertical section of a fruit, natural size.
10. A stone, natural size.
11. A seed, natural size.
12. An embryo, enlarged.
13. A winter branchlet, natural size.
14. Part of a leaf, with stipules, natural size.

C.E Faxon. del. Picart fr. sc.

PRUNUS NIGRA, Ait.

A. Riocreux direx.t Imp. R. Taneur, Paris.

PRUNUS AMERICANA.

Wild Plum.

CALYX-LOBES entire, pubescent on the inner surface. Stone turgid. Leaves oval or slightly obovate; petioles mostly eglandular.

Prunus Americana, Marshall, *Arbust. Am.* 111. — Darlington, *Ann. Lyc. N. Y.* iii. 87, t. 1; *Fl. Cestr.* ed. 3, 72. — Torrey & Gray, *Fl. N. Am.* i. 407 (in part). — Nuttall, *Sylva*, ii. 19 (in part), t. 48. — Torrey, *Fl. N. Y.* i. 194 (in part); *Emory's Rep.* 408; *Pacific R. R. Rep.* iv. 82. — Koch, *Dendr.* i. 101 (in part). — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 65. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 65 (in part). — Watson & Coulter, *Gray's Man.* ed. 6, 151 (in part). — Coulter, *Contrib. U. S. Nat. Herb.* ii. 102 (*Man. Pl. W. Texas*).

? **Prunus Mississippi**, Marshall, *Arbust. Am.* 112.

Prunus spinosa?, Walter, *Fl. Car.* 146 (not Linnæus).

Prunus hiemalis, Michaux, *Fl. Bor.-Am.* i. 284 (in part). — Desfontaines, *Hist. Arb.* ii. 206 (in part). — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 539. — Poiret, *Lam. Dict.* v. 679 (in part). — Persoon, *Syn.* ii. 35. — *Nouveau Duhamel*, v. 184 (in part). — Elliott, *Sk.* i. 542. — Schmidt, *Oestr. Baumz.* iv. 48, t. 231. — Spach, *Hist. Vég.* i. 398. — Roemer, *Fam. Nat. Syn.* iii. 59 (in part).

Prunus nigra, Muehlenberg, *Cat. Pl. Am. Sept.* ed. 2, 49 (not Aiton).

Cerasus hiemalis, De Candolle, *Prodr.* ii. 538 (in part). — Hooker, *Fl. Bor.-Am.* i. 168 (in part). — Don, *Gen. Syst.* ii. 514 (in part). — Loudon, *Arb. Brit.* ii. 704 (in part).

Cerasus nigra, Hooker, *Compan. Bot. Mag.* i. 24 (not Loiseleur).

Cerasus Americana, Hooker, *Compan. Bot. Mag.* i. 24.

A tree, twenty to thirty-five feet in height, with a trunk which rarely exceeds a foot in diameter and divides, usually four or five feet from the ground, into many spreading branches, often pendulous toward the extremities, which form a broad graceful head, and are furnished with long slender remote sometimes spinescent lateral spur-like branchlets. The bark of the trunk is half an inch thick and dark brown tinged with red, the outer layers separating into large thin persistent plates. The branchlets, when they first appear, are light green and glabrous or puberulous, or coated with dense pale tomentum; they are light orange-brown during their first winter, and in their second year are darker, often tinged with red, and marked with minute circular excrescences. The winter-buds are covered with chestnut-brown triangular scales with more or less erose margins; the inner scales when fully grown are foliaceous, half an inch long, oblong, acute, remotely serrate, furnished below the middle with two narrow acuminate lobes, and fall after the small colorless scales of the outer rows. The leaves are oval or slightly obovate, acuminate, narrowed and occasionally rounded at the base, sharply and often doubly serrate; when they unfold they are sometimes nearly glabrous, or are furnished on the lower surface with conspicuous tufts of pale hairs, or are pubescent or densely coated below with thick pale tomentum; at maturity they are rather coriaceous, more or less rugose, dark green on the upper, and paler on the lower surface, and glabrous or coated below with pale or rufous pubescence or tomentum; they are three or four inches long and an inch and a half broad, with slender midribs grooved on the upper side and narrow primary veins, and are borne on slender petioles one half to two thirds of an inch in length and usually destitute of glands.[1] The stipules are linear or often three-lobed, sharply serrate,

[1] The amount and character of the pubescence on the leaves and shoots of *Prunus Americana* vary considerably on different individuals and in different parts of the country; in the eastern and southern states the leaves are either glabrous or slightly pubescent on the lower surface along the midribs and primary veins; in the valley of the Mississippi the lower surface is often covered with pubescence; and from Missouri to northern Mexico, especially south of the Red River, the young branches, the lower surface of the leaves, and the petioles are coated with pale tomentum. This form which gradually passes into the smooth form of the east and of the Rocky Mountains is

Var. *mollis*, Torrey & Gray, *Fl. N. Am.* i. 407. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 65. — Havard, *Proc. U. S. Nat. Mus.* viii. 512. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 102 (*Man. Pl. W. Texas*).

one half to three quarters of an inch long, and early deciduous. The flowers, which appear in Texas early in March, and in Pennsylvania two months later, when the leaves are half grown, are produced in two to five-flowered umbels, and are borne on slender glabrous green pedicels which vary from one third to two thirds of an inch in length; on some individuals they are unisexual by the abortion of the pistils, and are, when expanded, an inch across and exhale a disagreeable odor. The calyx-tube is acutely obconic, light red, glabrous or puberulous, and green on the inside, with acuminate lobes, reflexed after anthesis, and slightly pubescent on the outer, and pilose on the inner surface. The petals are pure white, half an inch long and a quarter of an inch broad, rounded and irregularly laciniate at the apex, and contracted below into long narrow claws which are bright red at the base. The fruit, which ripens in June at the south, and from the end of August to early October at the north, is subglobose or rarely slightly elongated, and usually rather less than an inch in diameter; in ripening it turns from green to orange, often with a red cheek, and when fully ripe is bright red, usually destitute of bloom, and more or less conspicuously marked with pale spots; the skin is tough, thick, acerb, and easily separated from the bright yellow succulent rather juicy acid flesh which adheres to the oval stone; this is slightly rugose, pointed at the apex, more or less contracted at the base, turgid, often nearly as thick as it is broad, and slightly and acutely ridged on the ventral, and obscurely grooved on the dorsal suture.

Prunus Americana is distributed from middle and northern New Jersey[1] and central New York[2] to Nebraska,[3] the valley of the upper Missouri River in Montana,[4] the eastern slopes of the Rocky Mountains of Colorado,[5] the Chattahoochee region of western Florida, the valley of the Rio Grande in southern New Mexico, and the mountains of northeastern Mexico. In the middle and northern states it is found in rich soil, growing along the borders of streams and swamps, where it often forms thickets of considerable extent; in the southern Atlantic states it sometimes inhabits river-swamps, which are submerged during several months of each year, and west of the Mississippi River it grows on bottom-lands and sometimes on dry limestone uplands. At the north the Wild Plum-tree is rarely more than ten or fifteen feet in height, and it is in southern Arkansas and eastern Texas that it attains its greatest dimensions.

The wood of *Prunus Americana* is heavy, hard, close-grained, and strong. It has a lustrous surface and is dark rich brown tinged with red, with thin light-colored sapwood, and many medullary rays. The specific gravity of the absolutely dry wood is 0.7313, a cubic foot weighing 46.95 pounds.

The fruit is sometimes used in the preparation of jellies and preserves, and is eaten raw or cooked.[6]

Prunus Americana was first described by Humphrey Marshall, in his *Arbustum Americanum*, published in 1785; and in most subsequent works it has been confounded with *Prunus nigra* of Aiton, published four years later.[7]

As an ornamental plant *Prunus Americana* has real value; the long wand-like branches form a wide graceful head, which is handsome in winter, and in spring is covered with masses of pure white flowers, followed by ample bright foliage and abundant showy fruit.[8]

[1] Britton, *Cat. Pl. N. J.* 91.

[2] Dudley, *Bull. Cornell Univ.* ii. 27 (*Cayuga Fl.*).

[3] Bessey, *Bull. Agric. Exper. Stat. Nebraska*, iv. art. iv. 16.

[4] Where it was collected by Lester F. Ward, whose specimens are preserved in the U. S. Nat. Herb.

[5] Coulter, *Man. Rocky Mt. Bot.* 76.

[6] Much attention has been given in late years by American pomologists to the selection and cultivation of the best fruited varieties of *Prunus Americana*, and their lists now contain the names of many Plum-trees which are selected wild forms of this species. Of these perhaps the best known and the most generally esteemed are De Soto, Itaska, Forest Garden, Louisa, Minnetonka, Cheney, Deep Creek, Kickapoo, Forest Rose, and Miner.

[7] In the Linnæan Herbarium there is an unnamed specimen of *Prunus Americana* without flowers or fruit, and without locality, from Kalm the Swedish traveler, who included in his list of trees growing in the woods near Philadelphia, in 1748, the Wild Plum-tree and the Sloe-Shrub, which he called *Prunus domestica* and *Prunus spinosa* (*Travels*, English ed. i. 67, 68).

[8] As an ornamental plant *Prunus Americana* is not so often seen in the gardens of the eastern and northern states as *Prunus nigra*, which is a less beautiful plant although its flowers are earlier and considerably larger. It is well established in the Arnold Arboretum, where it flowers and fruits abundantly every year, and has proved to be one of the most beautiful plants of the genus.

EXPLANATION OF THE PLATE.

PLATE CL. PRUNUS AMERICANA.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. Vertical section of a fruit, natural size.
5. Cross section of a fruit, natural size.
6. A stone, natural size.
7. An embryo, enlarged.
8. A winter branchlet, natural size.

C.E. Faxon del. Rapine sc.

PRUNUS AMERICANA, Marsh.

A. Riocreux direx.t Imp. R. Taneur, Paris.

PRUNUS HORTULANA.

Wild Plum.

CALYX-LOBES glandular-serrate, pubescent on both surfaces. Leaves ovate-lanceolate, long pointed; petioles glandular. Stone turgid, compressed at the two ends, conspicuously rugose and pitted.

Prunus hortulana, L. H. Bailey, *Garden and Forest*, v. 90.

Prunus Americana, var. (?), Patterson, *List Pl. Oquawka*, 5.

Prunus Chicasa, Watson & Coulter, *Gray's Man.* ed. 6, 152 (in part).

A tree, twenty to thirty feet in height, with a slender often inclining trunk frequently five or six or occasionally ten or twelve inches in diameter, dividing, usually several feet from the ground, into stout spreading branches; or often a shrub with many upright stems, forming thicket-like clumps. The bark of the trunk is thin and dark brown, and separates into large thin persistent plates which in exfoliating display the light red-brown inner layers. The branches are stout, rigid, marked with minute pale lenticels, glabrous or sometimes puberulous during their first summer, rather dark brown when the tree grows in the shade of the forest, and usually unarmed; or on vigorous trees grown in the open ground they are sometimes bright red or red-brown in their first year, and darker brown in their second, and are then often armed with stout spinescent spur-like branchlets. The winter-buds are minute and obtuse, and are covered by chestnut-brown scales with slightly ciliate margins, those of the inner ranks accrescent with the growing shoots, oblong-lanceolate, acute, glandular-serrate, and sometimes half an inch long at maturity. The leaves are ovate-lanceolate, contracted at the apex into long slender points, wedge-shaped or more or less rounded at the narrow base, and finely serrate with incurved lanceolate glandular teeth; when they unfold they are pilose with slender white hairs, and at maturity are glabrous with the exception of the hairs which are gathered on the under surface in the axils of the primary veins or are scattered along the midribs; they are rather thick and firm, dark green and lustrous on the upper, and paler on the lower surface, and four to six inches long and an inch to an inch and a half broad, with broad conspicuous midribs orange-colored on the under, and slightly grooved on the upper surface, conspicuous orange-colored veins connected near the margin of the leaf, and prominent reticulate veinlets; they are borne on slender orange-colored petioles which vary from an inch to an inch and a half in length, and are furnished above the middle with numerous small scattered dark glands; and on vigorous shoots stand nearly at right angles with the stems. The stipules are lanceolate-acuminate, glandular-serrate, and early deciduous. The flowers, which in the neighborhood of St. Louis appear by the end of April or early in May with the unfolding of the leaves, vary from two thirds of an inch to an inch in diameter, and are produced in two to four-flowered subsessile umbels, on slender puberulous pedicels half an inch in length. The calyx-tube is narrowly obconic, puberulous on the outer surface, with ovate glandular-serrate lobes acute or rounded at the apex, pubescent on the outer, and pubescent or tomentose on the inner surface, and reflexed after the unfolding of the petals; these are narrowly obovate, rounded and occasionally emarginate at the apex and contracted below into long narrow claws, entire, erose, or occasionally serrate, and pure white, or often marked toward the base with orange. The stamens are as long as the petals or sometimes rather longer, with slender glabrous filaments and minute orange-colored anthers. The pistil is glabrous, with a slender style crowned by a thick truncate stigma. The fruit, which ripens in the neighborhood of St. Louis

in September and October, is borne on stout stems, and is globose or oblong and two thirds of an inch to an inch in diameter, with thick acerb deep red or sometimes yellow skin, and hard and austere thin flesh, which adheres to the turgid stone; this is acute and compressed at the two ends, conspicuously ridge-margined on the ventral, and broadly and deeply grooved on the dorsal suture, thick-walled, rugose, and deeply pitted.

Prunus hortulana inhabits the banks of the Mississippi River near Oquawka, Illinois, and St. Louis, Missouri; it is common on the banks of the Maramec River in Missouri, and will probably be found wild in southern Illinois and Indiana, in western Kentucky and Tennessee, and ranging through Arkansas to eastern Texas. It grows on the low banks of streams in rich moist soil, overflowed every winter and spring for several weeks, in forests of the Hackberry, the Honey Locust, the Sycamore, the Big-nut Hickory, the Swamp White Oak, the Pin Oak, the Green Ash, the Box Elder, and the Red Birch, with the Red Bud, the Silky Cornel, the Pawpaw, dwarf Willows, the Burning Bush, and the deciduous-leaved Holly.

For many years *Prunus hortulana* was confounded with *Prunus angustifolia*, the Chickasaw Plum, to which numerous cultivated Plum-trees that have been derived from it have been referred by pomologists. Mr. Harry N. Patterson[1] many years ago noticed its peculiarities, and Prof. L. H. Bailey[2] has recently pointed out its true characters.

The fruit of the wild trees is gathered in large quantities, and for years has been sold in the markets of St. Louis, and used for jellies and preserves; selected varieties sometimes produce excellent fruit, and have been largely cultivated, in the western states especially, for many years.[3]

[1] Harry Norton Patterson was born in 1853 in Oquawka, Illinois, where he was educated, and where from early youth he has been employed in printing. An early acquired love of botany led him to study the flora of the neighborhood of his native place, and has since carried him on several occasions to Colorado, where he has botanized extensively during four summers, and has made several interesting botanical discoveries. Mr. Patterson is the author of *A List of Plants collected in the Vicinity of Oquawka*, published in 1874, *A Catalogue of the Plants of Illinois*, published in 1876, and a *Check List of North American Plants*.

[2] Liberty Hyde Bailey was born in South Haven, Michigan, in 1858, graduated at the Agricultural College of his native state in 1882, and then, having studied botany with Professor Asa Gray at Cambridge during two years, was appointed in 1888 professor of horticulture and landscape gardening in the Michigan Agricultural College. This position he soon left to accept the chair of horticulture in Cornell University, which he still fills. Professor Bailey is the author of two important papers on North American Carices, three annual volumes of the *Annals of Horticulture in North America*, *The Horticulturist's Rule Book*, *The Nursery Book*, and *Field Notes on Apple Culture*, and of many horticultural and botanical articles. He has devoted special attention to the study of American fruit-trees, and our present knowledge of the history and distinctive characters of the various races of cultivated American Plum-trees is due to his long and careful study of this difficult and interesting subject.

[3] The first variety of this species which attracted attention, the now well-known Wild Goose Plum, believed to have been a native of Kentucky, where it originated about forty years ago, is now a valuable fruit-tree in some parts of the country; it is esteemed for its rapid growth and the excellence of its large juicy fruit, and is more largely cultivated than any other native Plum. Other varieties of *Prunus hortulana* well known to pomologists are Cumberland, Indian Chief, Garfield, Sucker City, Missouri Apricot (Honey Drop), Wayland, Indiana Red, Golden Beauty, Indiana Chief, Forest Rose, Parsons, and Miner (L. H. Bailey, *Bull. Cornell Univ. Agric. Exper. Stat.* No. 38).

A sterile tree, known as the Blackman Plum, believed to be a natural hybrid between the Peach and the Wild Goose Plum, appeared in Tennessee many years ago (*Rep. U. S. Dept. Agric.* 1886, 261; 1887, 636); and Professor Bailey reports another hybrid of similar origin.

EXPLANATION OF THE PLATE.

Plate CLI. Prunus hortulana.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. Interior face of a calyx-lobe, enlarged.
4. A petal, enlarged.
5. A fruiting branch, natural size.
6. A fruit cut transversely, natural size.
7, 8, and 9. Stones, natural size.
10. A seed, natural size.
11. An embryo, natural size.
12. A sterile branch, natural size.
13. A winter branchlet, natural size.

C.E. Faxon del. Rapine sc

PRUNUS HORTULANA, Bailey.

A. Riocreux direx.t Imp. R. Taneur, Paris.

PRUNUS ANGUSTIFOLIA.

Chickasaw Plum.

CALYX-LOBES glabrous, glandular-ciliate. Stone turgid. Leaves lanceolate to oblong-lanceolate, thin and lustrous; petioles biglandular.

Prunus angustifolia, Marshall, *Arbust. Am.* 111. — Koch, *Dendr.* i. 103. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 66.

Prunus Chicasa, Michaux, *Fl. Bor.-Am.* i. 284. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 540. — Poiret, *Lam. Dict.* v. 680. — Persoon, *Syn.* ii. 35. — *Nouveau Duhamel*, v. 183. — Elliott, *Sk.* i. 542. — Sprengel, *Syst.* ii. 476. — Audubon, *Birds*, t. 53. — Spach, *Hist. Vég.* i. 397. — Torrey & Gray, *Fl. N. Am.* i. 407. — Roemer, *Fam. Nat. Syn.* iii. 58. — Darlington, *Fl. Cestr.* ed. 3, 73. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 56. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 65. — Watson & Coulter, *Gray's Man.* ed. 6, 152 (in part). — Gray, *Forest Trees N. Am.* t. 47.

Prunus insititia, Walter, *Fl. Car.* 146 (not Linnæus). — Abbot, *Insects of Georgia*, ii. t. 60.

Cerasus Chicasa, Seringe, *De Candolle Prodr.* ii. 538. — Hooker, *Fl. Bor.-Am.* i. 168; *Compan. Bot. Mag.* i. 24. — Don, *Gen. Syst.* ii. 514.

A small tree, fifteen to twenty-five feet in height, with a trunk rarely exceeding eight inches in diameter, and slender spreading virgate branches often armed with long thin spinescent lateral branchlets; or more often a shrub five or six feet high, with many stems, forming broad thickets. The bark of the trunk is an eighth of an inch thick, dark red-brown and slightly furrowed, the surface broken into long thick appressed scales. The branchlets, when they first appear, are glabrous or covered with short caducous hairs, and are bright red and lustrous; in their second year they lose their lustre and grow darker, and are then often brown marked with occasional horizontal orange-colored lenticels. The winter-buds are acuminate and a sixteenth of an inch in length, and covered with chestnut-brown scales. The leaves are lanceolate or oblong-lanceolate, pointed at the two ends, apiculate, and sharply serrate with minute glandular teeth; they are glabrous or, while young, are sometimes furnished on the lower surface with tufts of long pale hairs in the axils of the primary veins, bright green and lustrous on the upper, and paler and rather dull on the lower surface, one to two inches long and a third to two thirds of an inch broad, and are borne on slender glabrous or puberulous bright red petioles, from a quarter to a half of an inch in length, and furnished near the apex with two conspicuous red glands. The stipules are linear or lobed, glandular-serrate, and half an inch long. The flowers, which appear before the leaves from the beginning of March in the extreme southern states until the middle of April at the north, and which are one third of an inch across, are produced in subsessile two to four-flowered umbels, and are borne on slender glabrous pedicels which vary from one fourth to one half of an inch in length. The calyx-tube is glabrous and campanulate, with oblong obtuse lobes, reflexed at maturity, ciliate on the margins with slender hairs, and covered on the inner surface with pale pubescence. The petals are white or creamy white, obovate, rounded at the apex, and contracted at the base into short broad claws. The filaments and pistil are glabrous. The fruit, which ripens between the end of May and the end of July, is globose or subglobose, half an inch in diameter, bright red, rather lustrous, and nearly destitute of bloom, with a thin skin, and tender juicy subacid yellow flesh adherent to the turgid stone, which is more or less thick-margined on the ventral, and conspicuously grooved on the dorsal suture.

Prunus angustifolia is widely naturalized, especially in the southern Atlantic and Gulf states, in all the region from southern Delaware and Kentucky to central Florida, eastern Kansas and eastern Texas. Occupying the margins of fields and other waste places near human habitations, usually in rich soil, it

appears like an escape from cultivation rather than an indigenous plant; and its origin and true home are still uncertain.[1]

The wood of *Prunus angustifolia* is heavy, although rather soft and not strong; it is light brown or red, with lighter colored sapwood and many thin medullary rays. The specific gravity of the absolutely dry wood is 0.6884, a cubic foot weighing 42.90 pounds.

The fruit, which varies greatly in quality, like that of all Plum-trees, is often sold in the markets of the middle and southern states, and it is eaten raw and cooked, and used for jellies and preserves.[2]

William Strachey, who accompanied Admiral Sir George Somers to Jamestown, Virginia, where he landed in May, 1610, and afterward published an account of the colony, is probably the first author to mention the Chickasaw Plum,[3] which was not described by any botanist until a hundred and seventy-five years later, in 1785, when it was included in the *Arbustum Americanum* by Humphrey Marshall.[4]

[1] The Chickasaw Plum has been occasionally cultivated a little to the north of the region in which it has become naturalized, but it has not been able to secure a foothold beyond the northern limits of this region, which is coextensive with that occupied by the Taxodium and several other southern trees. This fact seems to indicate a southern origin, as a plant of such peculiarly domestic habits, able to follow man everywhere in the south, and to hold its own against the native inhabitants of the soil, would have spread through the north if it had come originally from a cold region. The shrubby Plum of the high plateau east of the Rocky Mountains, which travelers have believed to be the original of the Chickasaw Plum, is probably distinct from this species, and it is not improbable that its natural home must be looked for south of the boundary of the United States. The fact that when the country was first visited by Europeans the Chickasaw Plum was always found in the neighborhood of Indian settlements in the south, seems to confirm the early Indian tradition that the tree had been brought by their ancestors from the region beyond the Mississippi River. It is interesting to note that the elder Michaux, who resided for several years in South Carolina toward the end of the last century, was told there that the Chickasaw Plum had been brought from the West Indies (*Fl. Bor.-Am.* i. 285).

[2] The fruit of *Prunus angustifolia* is sold in early summer in the markets of some of the cities of the middle states, under the name of "Mountain Cherry." Varieties of this tree, selected for the excellence of their fruit, are cultivated in the southern states. Of these, the best known to pomologists are Pottawattamie, Jennie Lucas, Early Red, Caddo Chief, Transparent, and Colleta, although many others are in cultivation.

[3] "They have cherries, much like a Damoizin, but for their taste and cullour we called them cherries; and a plomb there is, somwhat fairer then a cherrie, of the same relish, then which are seldome a better eaten." (*Historie of Travaile into Virginia Britannia*, ed. Major, 118.)

[4] According to Loudon, *Prunus angustifolia* was introduced into European gardens in 1806 (*Arb. Brit.* ii. 705). In eastern New England it is barely hardy, seldom flowering and never producing fruit.

EXPLANATION OF THE PLATE.

PLATE CLII. PRUNUS ANGUSTIFOLIA.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. Vertical section of a fruit, natural size.
5. A stone, cut transversely, natural size.
6. An embryo, natural size.
7. The end of a young leafy shoot, natural size.
8. A winter branchlet, natural size.

C. E. Faxon del. Picart fr. sc.

PRUNUS ANGUSTIFOLIA, Marsh.

A. Riocreux direx.t Imp. R. Taneur, Paris.

PRUNUS ALLEGHANIENSIS.

Sloe.

CALYX-LOBES entire, puberulous on the outer, tomentose on the inner surface. Fruit usually subglobose, dark blue covered with bloom; stone turgid, acute at the two ends. Leaves lanceolate to oblong-ovate.

Prunus Alleghaniensis, T. C. Porter, *Bot. Gazette*, ii. 85; *Garden and Forest*, iii. 428, f. 53. — Watson & Coulter, *Gray's Man.* ed. 6, 151.

A small slender tree, occasionally eighteen to twenty feet in height, with a trunk which is sometimes six or eight inches in diameter, and which divides into numerous erect rigid branches; or more often a shrub, usually four or five feet high. The bark of the trunk is dark brown and a quarter of an inch thick, the fissured surface broken into thin persistent scales. The branches, when they first appear, are coated with pale pubescence; this soon disappears and in their first winter they are dark red and rather lustrous, later becoming brown or finally nearly black, and are unarmed or sometimes armed with stout spinescent lateral spur-like branchlets, and are covered with minute pale lenticels. The winter-buds are a sixteenth of an inch long, and acuminate or obtuse, the accrescent inner scales scarious, oblong-acute, two thirds of an inch long, and bright red at the apex. The leaves are lanceolate to oblong-ovate, often long-acuminate and finely and sharply serrate with glandular-tipped teeth, and bear at the very base of the blade two large rather conspicuous glands; when they unfold they are covered with soft pubescence, and at maturity are puberulous on the upper surface, and on the lower surface are sometimes quite glabrous with the exception of a few hairs in the axils of the veins, or are covered, especially along the broad midribs and conspicuous veins, with rufous pubescence; they are rather thick and firm in texture, dark green above and paler below, two to three and a half inches long and two thirds of an inch to an inch and a quarter broad, and are borne on slender grooved pubescent or puberulous petioles which vary from a quarter to a third of an inch in length. The flowers, which appear in May with the unfolding of the leaves, are half an inch across when fully expanded, with slender puberulous pedicels from one half to two thirds of an inch in length, arranged in subsessile two to four-flowered umbels. The calyx-tube is narrowly obconic and pubescent or puberulous on the outer surface, with ovate-oblong lobes rounded at the apex, scarious on the margins, and coated with pale tomentum on the inner surface. The petals are pure white, rounded at the apex and contracted at the base into short claws, and in fading turn pink. The filaments and pistil are glabrous. The fruit, which is produced in great quantities and often quite covers the branches, ripens in the middle of August; it is borne on stout puberulous stems, and is subglobose or slightly oval or pear-shaped, and varies from one third to two thirds of an inch in diameter; the skin is thick, rather tough, and dark reddish-purple, covered with a glaucous bloom; the flesh is yellow, juicy, and austere, and adheres to the thin-walled turgid stone which is two thirds as thick as broad, from a quarter of an inch to half of an inch long, pointed at both ends, ridged on the ventral edge, and slightly grooved on the other.

Prunus Alleghaniensis is not known to grow spontaneously outside of a small elevated region in central Pennsylvania, which extends from the slopes of Tussey's Mountain in the northwestern part of Huntingdon County, across Bald Eagle Mountain and Valley, and over the main range of the Alleghanies into Clearfield and Elk Counties, and has a north and south range of only twenty or thirty miles. It grows in low moist soil, where it forms shrubby thickets, sometimes of considerable extent, and on the

dry ridges of the so-called "barrens"[1] of Huntingdon County, where it occasionally assumes the habit of a tree, associated usually with the Wild Crab-apple, the Scarlet Haw, the Bear Oak, the Black Oak, the Pig-nut, and the Red Cedar, reaching its largest size on the limestone bluffs north of the Little Juniata River.[2]

The wood of *Prunus Alleghaniensis* is heavy, hard, and close-grained, with many thin medullary rays; it is brown tinged with red, with thin pale sapwood composed of ten or twelve layers of annual growth; when absolutely dry the specific gravity is 0.7073, a cubic foot weighing 44.13 pounds.

The fruit is collected in large quantities, and is made into excellent preserves, jellies, and jams, which have a considerable local consumption.

Prunus Alleghaniensis was first distinguished by Mr. J. R. Lowrie[3] of Warriorsmark, Pennsylvania, in 1859; and the first account of it was published by Professor Thomas C. Porter[4] in 1877. It was introduced into the gardens of Lafayette College at Easton, Pennsylvania, in 1885, by Professor Porter, through whose agency it has now become an inhabitant of the Arnold Arboretum.

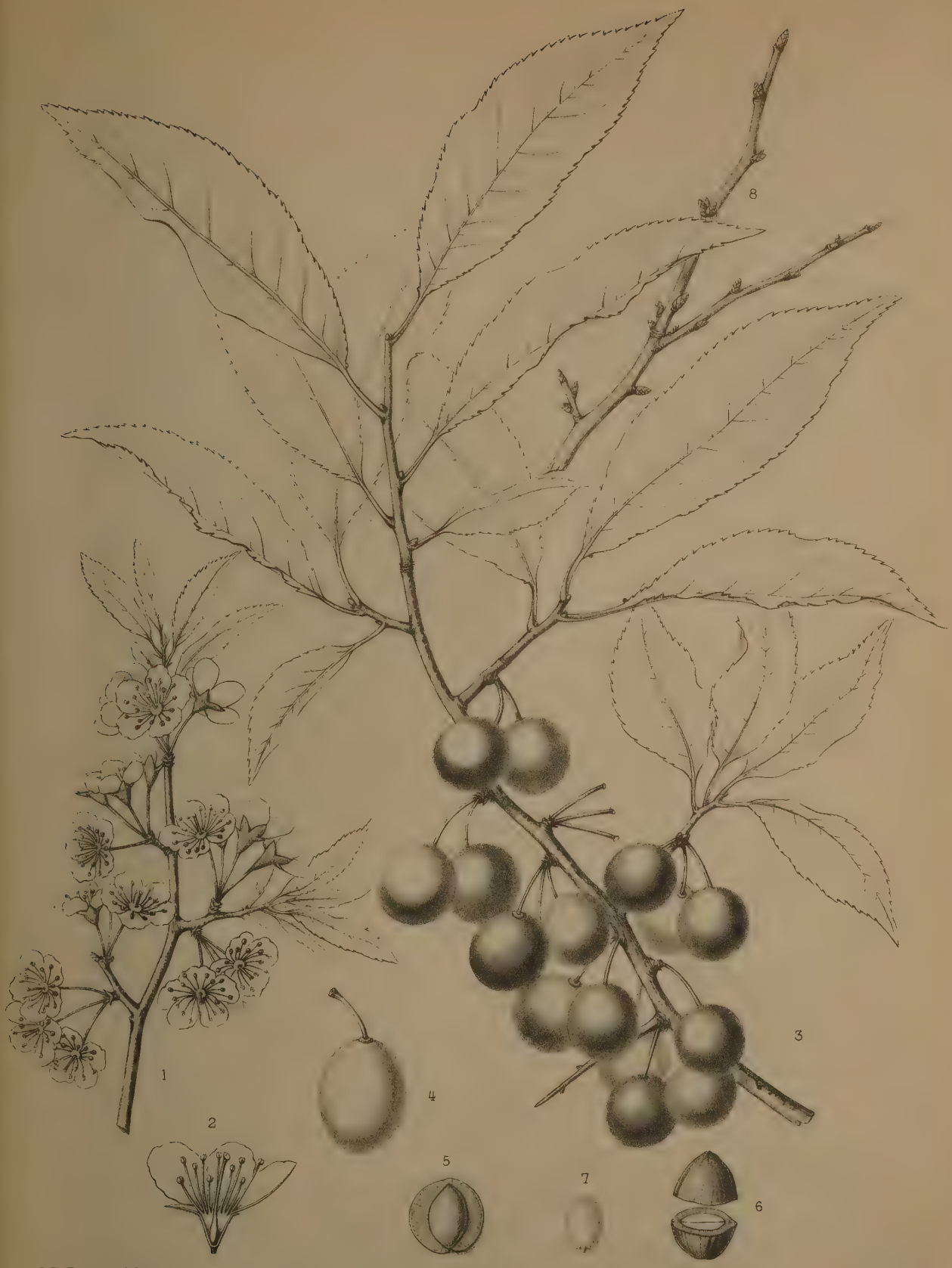
As an ornamental shrub or small tree, *Prunus Alleghaniensis* deserves a place in the garden for its abundant flowers and handsome fruit; this also possesses considerable culinary value, and, like that of other Plum-trees, will probably be improved by selection and cultivation.

[1] The name "barrens" is given to a plateau some twelve hundred feet above tide-water. It is ten or twelve miles broad and lies north of the Little Juniata River between Tussey's Mountain on the east and Bald Eagle Mountain on the west. The soil is sandy and underlaid by limestone which crops out in many places, with many extensive beds of iron ore in the troughs of the limestone. The soil, however, is by no means sterile, and when properly cultivated yields good crops.

[2] There is preserved in the Herbarium of Columbia College a specimen of a Prunus collected in Alabama many years ago by Mr. S. B. Buckley, and referred by Torrey & Gray (*Fl. N. Am.* i. 408) to their var. β. of *Prunus maritima*, and, in the same collection, a specimen of what is described as "a small tree ten to fifteen feet high; fruit oval, small, blue, glaucous, very austere to the taste," and which was seen many years ago in Lincoln County, North Carolina, by Mr. M. A. Curtis, who mentions it in his report of the trees of that state (*Rep. Geolog. Surv. N. Car.* 1860, iii. 56). It is possible, as Professor Britton is inclined to believe, that these specimens represent a southern form of *Prunus Alleghaniensis;* but they are without flowers, and hardly suffice to justify the extension of the range of the species, of which no other trace has been found in the now well explored region of the southern Alleghany Mountains.

[3] Jonathan Roberts Lowrie (1825–1885); a native of Butler, Pennsylvania, and the son of Walter Lowrie, a senator of the United States from Pennsylvania, graduated from Jefferson College in 1843 and devoted himself to the study of law, first practicing his profession at Hollidaysburg in Blair County, and then at Warriorsmark in Huntingdon County, at the foot of the eastern slope of the Alleghany Mountains. Here he passed the remainder of his life, occupied in the management of large business interests, which, however, left him leisure to devote himself to a critical study of the local flora. Lowrie's love of trees and shrubs, which is said to have amounted to a passion, led him to establish a large and interesting arboretum in his park at Warriorsmark, where many noble trees bear witness to his knowledge and skill.

[4] Thomas Conrad Porter, D. D., LL. D., was born at Alexandria, Huntingdon County, Pennsylvania, January 22, 1822, and graduated from Lafayette College in 1840, and from Princeton Theological Seminary in 1843. His father was a Presbyterian elder of more than fifty years standing, a man of influence and note, whose father came to Pennsylvania from Donachedy, Ireland, late in the last century. His maternal great-grandfather, John Conrad Bucher, of a German-Swiss family from the canton of Schaffhausen and a minister of the Reformed Church, emigrated to America in 1755 and died in 1780, the pastor of a congregation at Lebanon, Pennsylvania. Thomas C. Porter served a mission-church in Monticello, Alabama, for one year, and for another year was pastor of the Second Reformed Church of Reading, Pennsylvania. He then became successively professor of natural science in Marshall College, in Franklin and Marshall College, and in Lafayette College, where he has occupied the chair of botany since 1866. For nearly forty years Professor Porter has devoted particular attention to the flora of his native state, and he has built up the great collection of Pennsylvanian plants now preserved in the Herbarium of Lafayette College. He is the author of many papers relating to botany, including *A Catalogue of the Plants of Lancaster County, Pennsylvania*, published in Mombert's history of the county in 1869; *A Sketch of the Botany of Pennsylvania*, in Walling & Gray's Topographical Atlas, published in 1872; *A Sketch of the Botany of the United States*, in Gray's Atlas, published in 1873; *A List of the Carices of Pennsylvania*, published in the *Proceedings of the Academy of Natural Sciences of Philadelphia* in 1887; and of various papers relating to the flora of Colorado and other western territories, included in the reports of government surveys.



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PRUNUS ALLEGHANIENSIS, Porter

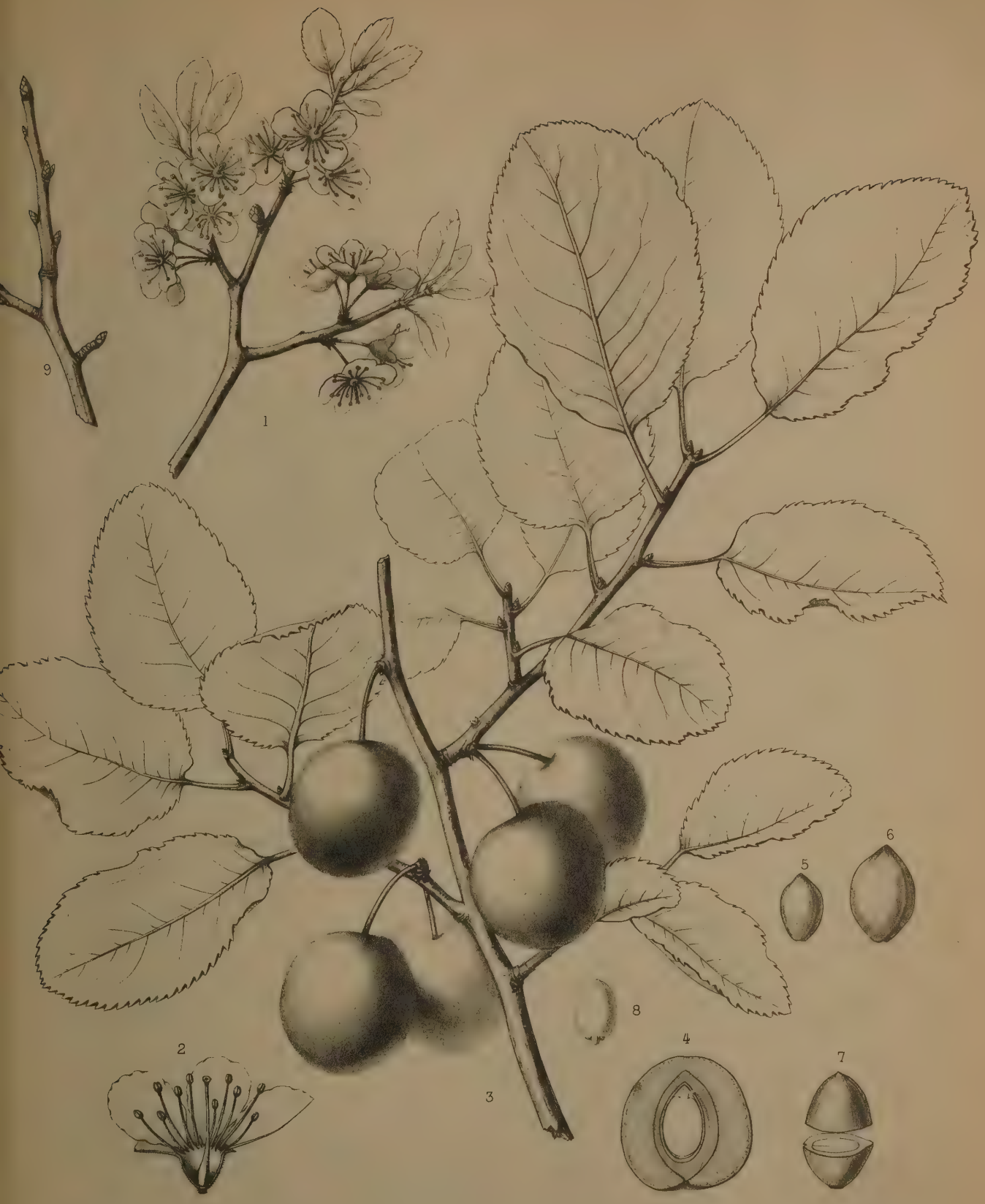
A. Riocreux dirext

Imp R. Taneur, Paris.

EXPLANATION OF THE PLATE.

PLATE CLIII. PRUNUS ALLEGHANIENSIS.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. A fruit, natural size.
5. Vertical section of a fruit, natural size.
6. A stone cut transversely, enlarged.
7. An embryo, enlarged.
8. A winter branchlet, natural size.



C.E Faxon del. Himely sc

PRUNUS SUBCORDATA, Benth.

A. Riocreux direx.t Imp. R. Taneur, Paris.

PRUNUS SUBCORDATA.

Wild Plum.

CALYX-LOBES pubescent or puberulous. Stone flattened or turgid, pointed at the two ends. Leaves broadly ovate to orbicular.

Prunus subcordata, Bentham, *Pl. Hartweg.* 308. — Walpers, *Ann.* ii. 464. — Torrey, *Pacific R. R. Rep.* iv. 82. — Newberry, *Pacific R. R. Rep.* vi. 73. — Brewer & Watson, *Bot. Cal.* i. 167 (in part). — J. G. Lemmon, *Pittonia*, ii. 68. — Greene, *Fl. Francis.* 49; *Garden and Forest*, iv. 255.

A small tree, twenty to twenty-five feet in height, with a trunk sometimes a foot in diameter, dividing, six or eight feet from the ground, into stout almost horizontal branches; or often a shrub, with stout ascending stems ten or twelve feet tall, or a low scraggy much branched bush. The bark of the trunk is a quarter of an inch thick, gray-brown, deeply fissured, and divided into long thick plates, their surface broken into minute persistent scales. The young branchlets are glabrous or pubescent, and are covered with bright red bark marked by occasional minute pale lenticels, and in their second year become darker red or purple, ultimately turning dark brown or ashy gray. The winter-buds are acute and an eighth of an inch long, and are covered with chestnut-brown scales with scarious margins, those of the inner rows accrescent with the young shoots and at maturity a quarter of an inch in length, oblong, acute, and generally bright red. The leaves are broadly ovate or orbicular, usually cordate, sometimes truncate, or rarely cuneate at the base, and are sharply and often doubly serrate; when they unfold they are puberulous on the upper, and pubescent on the under surface, and at maturity they are glabrous or more or less puberulous below, an inch to three inches long, half an inch to two inches broad, slightly coriaceous, dark green on the upper, and pale on the lower surface, with broad midribs, grooved on the upper side, and conspicuous veins. The stipules are lanceolate, acute, glandular-serrate, and caducous. In autumn at the north the leaves assume, before falling, brilliant scarlet and orange or red and yellow colors.[1] The flowers, which appear before the leaves in March or April, are two thirds of an inch across and are produced in subsessile two to four-flowered umbels on slender glabrous or pubescent pedicels which vary from a quarter to one half of an inch in length. The calyx is campanulate and glabrous or puberulous, with oblong-obovate lobes rounded at the apex, pubescent on the outer, and more or less covered with pale hairs on the inner surface, and half the length of the white petals which are obovate, rounded above and contracted at the base into short claws, and in fading turn rose-color. The filaments and ovary are glabrous, and the slender style is funnel-shaped at the apex. The fruit, which ripens in August or September, is oblong and from half an inch to an inch and a quarter in length, and is borne on a stout stem from half an inch to two thirds of an inch in length; the skin is dark red or rich purple or sometimes bright yellow; the flesh is more or less succulent, subacid, often of excellent flavor, and adherent to the flattened or turgid stone, which is acute at the two ends, narrowly wing-margined on the ventral edge, conspicuously grooved on the other, and from a third of an inch to an inch in length.[2]

Prunus subcordata inhabits the region west of the Cascade and Sierra Nevada Mountains from

[1] E. W. Hammond, *Garden and Forest*, iii. 626.

[2] J. G. Lemmon distinguishes (*Pittonia*, ii. 67) as variety *Kelloggii*, a form of *Prunus subcordata* first noticed many years ago by Dr. Albert Kellogg, and common in Sierra County and at the base of Mount Shasta, California, with ashy gray branches, nearly glabrous orbicular or elliptical leaves wedge-shaped at the base, and yellow ovate juicy fruit an inch or more in length. (See *Hutching's Magazine*, v. 7. — Wickson, *California Fruits and How to Grow Them*, ed. 2, 51. — Greene, *Fl. Francis.* i. 49.)

southern Oregon to central California. It is found in the neighborhood of streams, sometimes forming thickets of considerable extent, on dry rocky hills and in open woods, and is most common in southern Oregon and northern California, and there produces the best and most abundant fruit, reaching its greatest size on the borders of small streams, in deep rich rather moist soil, where it grows with the Oregon White Oak, the Choke Cherry, the Oregon Hawthorn, the Crab-apple, and various species of Cornel. In central California, where *Prunus subcordata* is common on the foothills of the coast ranges, and often ascends to considerable elevations on the western slopes of the Sierra Nevada, it is usually a low shrub, producing sparingly small acid fruit.

The wood of *Prunus subcordata* is heavy, hard, and close-grained, with a satiny surface susceptible of taking a good polish. It is pale brown, with thin lighter colored sapwood composed of five or six layers of annual growth, and contains many thin inconspicuous medullary rays. The specific gravity of the absolutely dry wood is 0.6412, a cubic foot weighing 40.01 pounds.

The fruit of *Prunus subcordata* is collected in Oregon and northern California, and is consumed in large quantities both fresh and dried, and is used for preserves and jellies.[1]

The first botanists who explored Oregon and California failed to notice the Wild Plum, and it was not known until 1836 or 1837, when Karl Theodore Hartweg[2] found it in the upper valley of the Sacramento River.

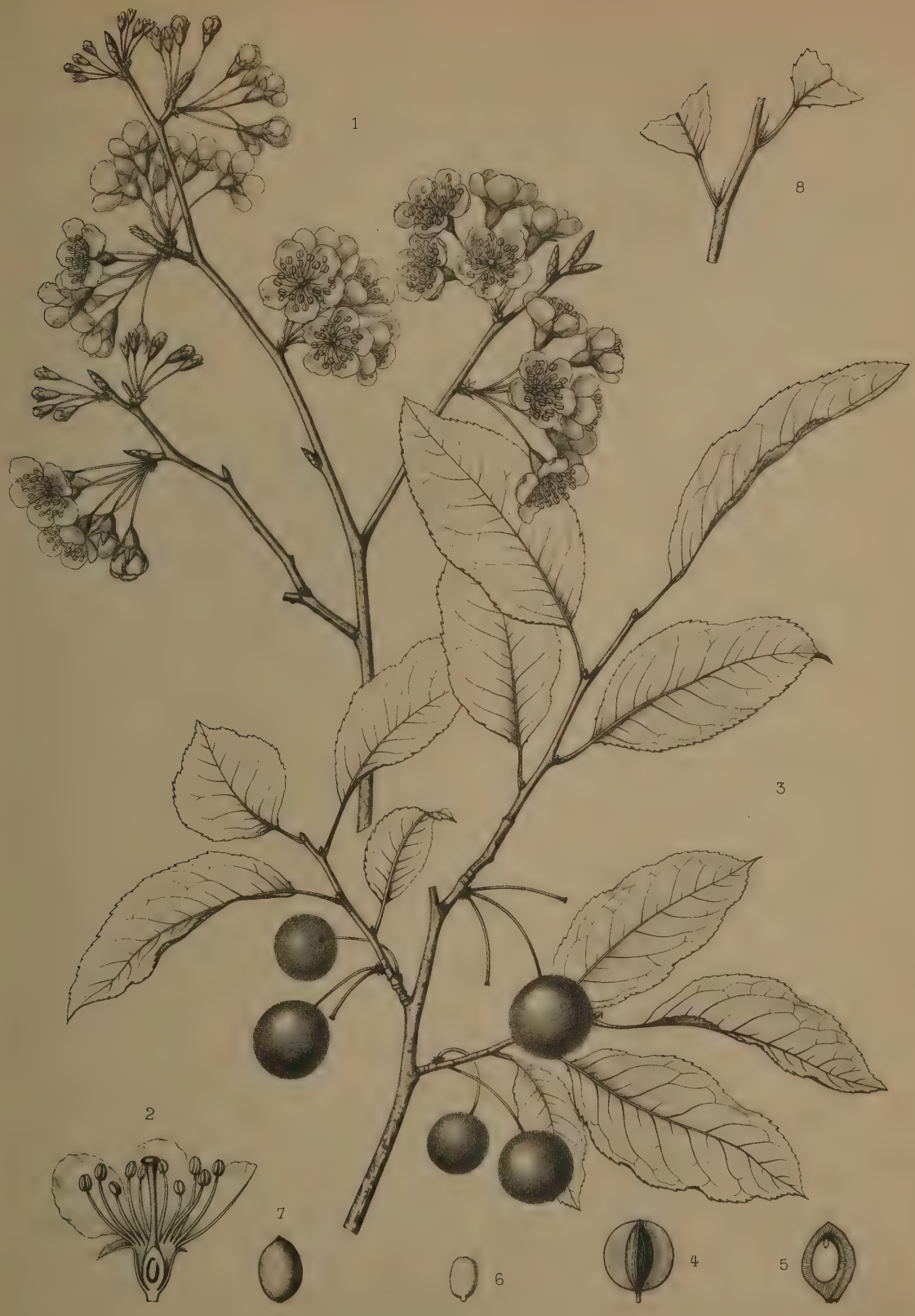
[1] In northern California, where for several years some attention has been paid to improving it, *Prunus subcordata* produces in cultivation more abundant crops of larger fruit than are borne on the wild trees; and the quality of the fruit of selected seedlings shows that valuable garden varieties can be obtained from this species. It has also been found useful as stock upon which to graft varieties of the European Plums. (See *Rep. Cal. Agric. Soc.* 1858, 183. — *Pacific Rural Press*, iv. 163, 198. — Wickson, *California Fruits and How to Grow Them*, ed. 2, 52.)

[2] See ii. 34.

EXPLANATION OF THE PLATE.

PLATE CLIV. PRUNUS SUBCORDATA.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. Vertical section of a fruit, natural size.
5, 6, and 7. Stones, natural size.
8. An embryo, enlarged.
9. Winter branchlet, natural size.



C E. Faxon del. Picart fr. sc.

PRUNUS UMBELLATA, Ell.

A. Riocreux direx.t Imp. R. Taneur, Paris.

PRUNUS UMBELLATA.

Sloe. Black Sloe.

CALYX-LOBES entire, glabrous or pubescent on the outer, tomentose on the inner surface. Fruit black covered with bloom. Leaves obovate-lanceolate to oblong.

Prunus umbellata, Elliott, *Sk.* i. 541. — Dietrich, *Syn.* iii. 44. — Chapman, *Fl.* 119. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 67.

? Prunus pumila, Walter, *Fl. Car.* 146 (not Linnæus).

Cerasus umbellata, Torrey & Gray, *Fl. N. Am.* i. 409. — Roemer, *Fam. Nat. Syn.* iii. 78.

A tree, sometimes fifteen or twenty feet in height, with a short often crooked or inclining trunk six to ten inches in diameter, and slender unarmed branches which form a wide compact flat-topped head; or frequently a low shrub. The bark of the trunk is a quarter of an inch thick, the dark brown surface separating into small appressed persistent scales. The branchlets, when they first appear, are more or less densely coated for a short time with pale pubescence; they soon become glabrous and are covered with a lustrous bright red bark which, in their second year, is dark brown and lustreless, and is marked with occasional orange-colored oblong lenticels. The winter-buds are a sixteenth of an inch long and are protected by acute chestnut-brown apiculate scales; those of the inner rows lengthen with the young shoots and at maturity are a quarter of an inch in length and red-tipped. The leaves are obovate-lanceolate to oblong, acute at both ends or sometimes rounded or slightly cordate at the base, finely and sharply serrate with remote incurved glandular teeth, and usually furnished with two large dark glands at the very base of the blade; when they unfold they are bright bronze-green with red margins, midribs, and petioles, and are membranaceous, glabrous on the upper surface, and pubescent or glabrous on the lower with the exception of a few hairs along the prominent orange-colored midribs and primary veins; at maturity they are two to two and a half inches in length and an inch to an inch and a half in breadth, membranaceous, dark green above and paler below, and are borne on stout glabrous or pubescent petioles. The stipules are lanceolate, setaceous, glandular-serrate, from one fourth to two thirds of an inch long, and caducous. The flowers, which expand in March and April before the appearance of the leaves, are two thirds of an inch across and are borne on slender glabrous pedicels half an inch long, in three or four-flowered subsessile umbels. The calyx-tube is broadly obconic, glabrous or puberulous on the outside, with acute red tipped lobes sometimes slightly cleft at the apex, scarious on the margins, and coated on the inner surface with thick white tomentum. The petals are nearly orbicular and are contracted at the base into short claws. The filaments and pistil are glabrous. The fruit, which ripens from July to September, is borne on a slender stem which varies from half an inch to nearly an inch in length; it is globose without a basal depression, half an inch in diameter, and is tipped with the remnant of the style; the skin is tough, thick, and bright red when the fruit is first fully grown, but black or nearly so when it is ripe, and then covered with a glaucous bloom; the flesh is thick and acid and adheres to the flattened stone, which is half as thick as it is broad, acute at both ends, slightly rugose, conspicuously ridged on one margin and slightly grooved on the other, with thin and brittle walls.

Prunus umbellata is distributed through the maritime portions of the southern Atlantic and Gulf states from South Carolina to Mosquito Inlet in Florida, and from Tampa Bay to eastern Mississippi; it reappears on the banks of the Mississippi River near Baton Rouge, Louisiana, and is scattered through the valley of the Red River from Alexandria to Shreveport, Louisiana, and to near Camden in southern Arkansas. It grows on the rich sandy bottom-lands of rivers and large creeks, and along

the borders of the forests of Long-leaved Pine, which it enlivens in the early days of spring with its profusion of pure white flowers.

The wood of *Prunus umbellata* is heavy, hard, and close-grained, with many thin medullary rays; it is dark red-brown, with thick lighter colored sapwood composed of about thirty layers of annual growth. The specific gravity of the absolutely dry wood is 0.8202, a cubic foot weighing 51.11 pounds.

The fruit is gathered in large quantities and is used in making jellies and jams.

Prunus umbellata appears to have escaped the notice of the botanists who explored the flora of the southern states during the last century, and was first distinguished by Stephen Elliott, who published the earliest account of it in his *Sketch of the Botany of South Carolina and Georgia.*[1]

[1] It is remarkable that this very distinct and common plant, which in early spring is a most attractive and conspicuous feature of the coast region of Georgia and northern Florida, should have been overlooked by such keen observers as Catesby, John and William Bartram, and the two Michauxs, who were all familiar with this region and who traveled several times through a portion of it at least. Elliott considered the *Prunus pumila* of Walter (*Fl. Car.* 146) identical with his *Prunus umbellata*, but Walter's description is so meagre and vague that the identity of his plant is very doubtful.

EXPLANATION OF THE PLATE.

Plate CLV. Prunus umbellata.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. Vertical section of a fruit, part of the flesh removed, natural size.
5. Vertical section of a stone, enlarged.
6. An embryo, enlarged.
7. A stone, natural size.
8. Part of a leafy young branchlet with stipules, natural size.

C.E. Faxon del. Picart fr. sc.

PRUNUS PENNSYLVANICA, L.F.

A. Riocreux direx.t Imp. R. Taneur, Paris.

PRUNUS PENNSYLVANICA.

Wild Red Cherry. Bird Cherry.

CALYX-LOBES obtuse, entire. Stone oblong. Leaves oblong-lanceolate, long-pointed.

Prunus Pennsylvanica, Linnæus f. *Syst.* ed. 13, Suppl. 252. — Willdenow, *Berl. Baumz.* 248; *Spec.* ii. pt. ii. 992; *Enum.* 518. — Abbot, *Insects of Georgia*, i. t. 45. — Poiret, *Lam. Dict.* v. 673. — Persoon, *Syn.* ii. 35. — Pursh, *Fl. Am. Sept.* i. 331. — Nuttall, *Gen.* i. 302. — Sprengel, *Syst.* ii. 477. — Hayne, *Dendr. Fl.* 73. — Dietrich, *Syn.* iii. 42. — Chapman, *Fl.* 120. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 57. — Koch, *Dendr.* i. 117. — Brunet, *Cat. Vég. Lig. Can.* 21. — Emerson, *Trees Mass.* ed. 2, ii. 513. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 66. — Coulter, *Man. Rocky Mt. Bot.* 77. — Watson & Coulter, *Gray's Man.* ed. 6, 152.

Prunus-Cerasus montana, Marshall, *Arbust. Am.* 113.

Prunus lanceolata, Willdenow, *Berl. Baumz.* 240, t. 3, f. 3.

Cerasus borealis, Michaux, *Fl. Bor.-Am.* i. 286. — *Nouveau Duhamel*, v. 32. — Michaux f. *Hist. Arb. Am.* iii. 159, t. 8. — De Candolle, *Prodr.* ii. 538. — Don, *Gen. Syst.* ii. 513. — Loudon, *Arb. Brit.* ii. 703, f. 410. — Roemer, *Fam. Nat. Syn.* iii. 78.

Prunus borealis, Poiret, *Lam. Dict.* v. 674. — Pursh, *Fl. Am. Sept.* i. 330. — W. P. C. Barton, *Compend. Fl. Phil.* i. 223. — Nuttall, *Gen.* i. 302. — Loddiges, *Bot. Cab.* t. 1598. — Bigelow, *Fl. Boston.* ed. 2, 193.

Prunus persicifolia, Desfontaines, *Hist. Arb.* ii. 205.

Cerasus Pennsylvanica, Loiseleur, *Nouveau Duhamel*, v. 9. — De Candolle, *Prodr.* ii. 539. — Hooker, *Fl. Bor.-Am.* i. 168. — Don, *Gen. Syst.* ii. 514. — Torrey & Gray, *Fl. N. Am.* i. 409. — Gray, *Forest Trees N. Am.* t. 48.

Cerasus persicifolia, Loiseleur, *Nouveau Duhamel*, v. 9. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 530. — De Candolle, *Prodr.* ii. 537. — Don, *Gen. Syst.* ii. 513. — Spach, *Hist. Vég.* i. 411. — Roemer, *Fam. Nat. Syn.* iii. 81. — Carrière, *Rev. Hort.* 1869, 272, f. 63.

A tree, with bitter aromatic bark and leaves, thirty to forty feet in height, with a trunk often twelve or eighteen inches in diameter, and regular slender horizontal branches which form a narrow head usually more or less rounded at the summit; or, at the extreme northern and western limits of its range, often a low shrub. The bark of the trunk, which varies from one third to one half of an inch in thickness, separates horizontally into broad persistent papery plates with a dark red-brown surface marked with irregular horizontal bands of orange-colored lenticels, and is smooth on young stems or branches but on old trees is broken into minute persistent scales. The branches, when they first appear, are light red and sometimes slightly puberulous; they soon become glabrous, and in their first winter are bright red, lustrous, and covered with pale excrescences; in their second year short thick lateral spur-like branchlets are developed, and the outer bark, which has now lost its lustre and is marked by bright orange-colored lenticels, is easily separable from the brilliant green inner bark. The leaves are oblong-lanceolate, sometimes slightly falcate, long pointed and finely and sharply serrate with incurved teeth often tipped with minute glands; for a short time after they first unfold they are bronze-green, pilose on the lower surface and slightly viscid; they soon become green and glabrous, and at maturity are bright and lustrous on the upper, and rather paler on the lower surface, three to four and a half inches long and three quarters of an inch to an inch and a quarter broad, and are borne on slender glabrous or slightly pilose petioles which vary from half an inch to nearly an inch in length, and are often glandular above the middle. The stipules are acuminate, glandular-serrate, and early deciduous. The leaves in autumn turn a bright clear yellow some time before falling. The flowers, which appear in early May when the leaves are half grown, or at the extreme north and at high elevations as late as the first of July, are half an inch across when expanded, and are borne on slender pedicels nearly an inch in length collected in four or five-flowered umbels, which are generally clustered two or three together and are subsessile when the flowers expand, but ultimately stalked. The calyx-tube is glabrous, broadly obconic with obtuse lobes tipped with red and reflexed at maturity, and is

marked in the mouth of the throat with a conspicuous light orange-colored band. The petals are creamy white, a quarter of an inch long, nearly orbicular, and contracted at the base into short claws. The filaments and pistil are glabrous. The fruit, which ripens between the first of July and the first of September, is globular, a quarter of an inch in diameter, tipped with the remnant of the style, and light red with a thick skin, thin sour flesh, and an oblong stone which has thin brittle walls and is ridged on the ventral margin.

Prunus Pennsylvanica is distributed from Newfoundland to the shores of Hudson's Bay and west to the eastern slopes of the coast range of British Columbia in the valley of the Frazer River,[1] and south through the northern states to Pennsylvania, central Michigan, northern Illinois, and central Iowa. It is common on the high mountains of North Carolina, on the eastern slopes of the Rocky Mountains of Colorado, and in all the forest regions of the extreme northern states, growing in moist rather rich soil, reaching its greatest size on the western slopes of the Big Smoky Mountains in Tennessee, and often occupying, to the exclusion of other trees, large areas cleared by fire of their original forest covering.[2]

The wood of *Prunus Pennsylvanica* is light, soft, and close-grained, with numerous medullary rays. It is light brown, with thin yellow sapwood, and when absolutely dry has a specific gravity of 0.5023, a cubic foot weighing 31.30 pounds.

The fruit is often used domestically and by herbalists in the preparation of cough-mixtures.

Prunus Pennsylvanica[3] was first introduced into English gardens in 1773[4] by Lee & Kennedy, nurserymen at Hammersmith, although it was not described until eight years later; and it was established in the Botanical Gardens of Berlin toward the end of the last century.[5] It grows rapidly in cultivation, and is a handsome and shapely although short-lived tree, and in early spring is conspicuous for the great quantity of flowers which cover its branches.

[1] Macoun, *Cat. Can. Pl.* i. 125.

[2] The ease with which the seeds of *Prunus Pennsylvanica* are disseminated by birds and mountain streams, their vitality and power of germination in soil where the upper layers of humus have been destroyed by fire, and the rapid growth of the young plants, which soon form a covering for longer lived trees, constitute the chief value and interest of this plant, which, in the northern part of the country east of the mid-continental plateau, has played an important part in the reproduction and preservation of the forests. (See Michaux f. *Hist. Arb. Am.* iii. 160. — Robert Douglas, *Garden and Forest*, ii. 285.)

[3] In some parts of the country *Prunus Pennsylvanica* is also called Pin Cherry and Pigeon Cherry.

[4] Aiton, *Hort. Kew.* ed. 2, iii. 198.

[5] Willdenow, *Berl. Baumz.* 248.

EXPLANATION OF THE PLATE.

PLATE CLVI. PRUNUS PENNSYLVANICA.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. Vertical section of a fruit, enlarged.
5. Cross section of a fruit, enlarged.
6. An embryo, enlarged.
7. Portion of a leaf with stipules, natural size.
8. A winter branchlet, natural size.

PRUNUS EMARGINATA.

Wild Cherry.

CALYX-LOBES rounded or sometimes emarginate. Stone ovoid, pointed at the two ends. Leaves oblong-obovate to oblanceolate, usually rounded at the apex.

Prunus emarginata, Walpers, *Rep.* ii. 9. — Dietrich, *Syn.* iii. 42. — Watson, *King's Rep.* v. 79. — Torrey, *Bot. Wilkes Explor. Exped.* 284. — Brewer & Watson, *Bot. Cal.* i. 167. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 67.

Cerasus emarginata, Douglas; Hooker, *Fl. Bor.-Am.* i. 169. — Don, *Gen. Syst.* ii. 515. — Loudon, *Arb. Brit.* ii. 714. — Torrey & Gray, *Fl. N. Am.* i. 410. — Roemer, *Fam. Nat. Syn.* iii. 79. — Torrey, *Pacific R. R. Rep.* iv. 83. — Bolander, *Proc. Cal. Acad.* iii. 79.

Cerasus erecta, Presl, *Epimel. Bot.* 194.

Prunus erecta, Walpers, *Ann.* iii. 854.

Cerasus Pattoniana, Carrière, *Rev. Hort.* 1872, 135, f. 17.

Cerasus glandulosa, Kellogg, *Proc. Cal. Acad.* i. 59.

A tree, with exceedingly bitter bark and leaves, thirty to forty feet in height, with a trunk twelve to fourteen inches in diameter, dividing into a number of slender rather upright branches which form a symmetrical oblong head; or often a shrub with spreading stems three to ten feet tall. The bark of the trunk is a quarter of an inch thick, with a generally smooth dark brown surface marked by horizontal light gray interrupted bands, and by rows of oblong orange-colored lenticular excrescences. The branches, when they first appear, are coated with pale pubescence, and are slender and flexible; in their first winter they are covered with dark red-brown bark marked by many minute dots, and in their second season, when they develop short lateral branchlets, with bright red bark conspicuously marked by large pale lenticels. The winter-buds are acute, an eighth of an inch long, and covered with chestnut-brown scales often slightly scarious on the margins; those of the inner ranks are acuminate at maturity, glandular-serrate above the middle, scarious, and nearly half an inch in length, with bright red tips. The leaves are oblong-obovate to oblanceolate, rounded, and usually obtuse or sometimes acute at the apex, the two forms appearing occasionally on the same branch; they are narrowed at the base, which is generally furnished with one or two and sometimes three or four large dark glands, and are serrate, the minute teeth tipped with short subulate glandular points; when they unfold they are puberulous or pubescent on the lower surface and slightly viscid, and when fully grown are glabrous or pubescent on the lower surface, one to three inches long and from one third of an inch to one and a half inches broad, dark green above, paler below, and borne on short stout grooved and usually pubescent petioles. The stipules are lanceolate-acuminate, glandular-serrate, and early deciduous. The flowers, which appear when the leaves are about half grown, at the end of April at the level of the ocean or as late as the end of June at high elevations, and which when expanded vary from one third to one half of an inch in diameter, are produced in six to twelve-flowered glabrous or pubescent corymbs an inch to an inch and a half in length, on slender pedicels from the axils of foliaceous glabrous glandular-serrate bracts. The calyx-tube is obconic, glabrous, or puberulous on the outer surface, and bright orange-colored in the throat, with short lobes rounded or emarginate or somewhat cleft at the apex, sometimes slightly glandular on the margins, and reflexed at maturity. The petals are white faintly tinged with green, obovate, rounded or emarginate at the apex, and contracted below into short claws. The ovary[1] and filaments are glabrous, and the style, which enlarges into a stout clavate stigma, is sometimes slightly glandular. The fruit, which ripens from June to August, is globose, from one fourth to one half of an inch in diameter, and more or less translucent, and when first fully grown is bright red, becoming

[1] In northeastern Idaho Professor Greene found bipistillate flowers of this species, with two drupes from each flower (*Garden and Forest*, iv. 243).

darker and almost black when ripe; the flesh is thin, bitter, and astringent; the stone is ovoid and pointed at both ends, with a prominent grooved ridge on the ventral margin, and is rounded and slightly grooved on the other, with thick brittle and slightly pitted walls.[1]

Prunus emarginata is distributed from the valley of the upper Jocko River in Montana[2] along the mountain ranges of Idaho and Washington and of southern British Columbia to Vancouver Island,[3] and through western Oregon and northern California and along the coast ranges to the neighborhood of the Bay of San Francisco, and on the western slopes of the Sierra Nevada Mountains, where it sometimes reaches an elevation of five or six thousand feet, to the Yosemite Valley; it is common on the Santa Lucia and San Bernardino Mountains[4] in California: on the eastern slopes of the Sierras it ranges to the shores of Lake Tahoe and the neighborhood of Carson City,[5] and it occurs on the Washoe Mountains[6] in Nevada. *Prunus emarginata* grows usually near the banks of streams in low rich soil, or less commonly on dry hill-slopes, attaining its best dimensions on Vancouver Island, in western Oregon and Washington, and on the Santa Lucia Mountains of California, where, at elevations of from three to four thousand feet, it becomes a tree sometimes forty feet in height; on the coast ranges of middle California and on the Sierra Nevada Mountains it is commonly a shrub five to eight feet high.[7]

The wood of *Prunus emarginata* is close-grained, soft, and brittle, and contains numerous thin medullary rays; it is brown streaked with green, with paler sapwood composed of eight or ten layers of annual growth. The specific gravity of the absolutely dry wood is 0.4502, a cubic foot weighing 28.06 pounds.

The fruit is said to have been eaten by the Indians of the northwestern coast.[8]

Prunus emarginata was discovered in the valley of the Columbia River in 1825 by David Douglas.[9] It is cultivated as a shade tree in the streets of Portland, Oregon, where it attains the height of forty feet, and assumes the habit of the common European Cherry-tree;[10] in 1881 it was introduced from Oregon into the Arnold Arboretum, where it is perfectly hardy, flowering and ripening its fruit every year.[11]

[1] *Prunus emarginata* varies in the amount of pubescence which clothes the young shoots, the lower surface of the foliage, and the inflorescence. At the north it is more often pubescent than glabrous, and the pubescent form is not uncommon on the mountains of southern California. It has been distinguished as —

Var. *mollis*, Brewer & Watson, *Bot. Cal.* i. 167. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 67. — Macoun, *Cat. Can. Pl.* i. 125.

Cerasus mollis, Douglas; Hooker, *Fl. Bor.-Am.* i. 164. — Hooker, *Lond. Jour. Bot.* vi. 217. — Don, *Gen. Syst.* ii. 515. — Torrey & Gray, *Fl. N. Am.* i. 410. — Loudon, *Arb. Brit.* ii. 714. — Nuttall, *Sylva*, ii. 14, t. 46. — Roemer, *Fam. Nat. Syn.* iii. 79. — Cooper, *Pacific R. R. Rep.* xii. pt. ii. 29, 59; *Am. Nat.* iii. 406. — Lyall, *Jour. Linn. Soc.* vii. 131.

Prunus mollis, Walpers, *Rep.* ii. 9. — Dietrich, *Syn.* iii. 42. — Torrey, *Bot. Wilkes Explor. Exped.* 284. — Macoun, *Rep. Geolog. Surv. Can.* 1875–76, 194.

[2] Here it was found in 1883 by Canby and Sargent.

[3] Macoun, *l. c.* 513.

[4] The pubescent form of *Prunus emarginata* was discovered in Bear Valley in June, 1885, by Mr. S. B. Parish.

[5] Here it was collected in 1864 by Dr. C. L. Anderson.

[6] Teste Watson, *King's Rep.* v. 79.

[7] The shrubby glabrous Cherry-tree of central California is considered by Professor Greene a species, to which he has given the name of *Cerasus Californica* (*Fl. Francis.* i. 50. — *Garden and Forest*, iv. 243). Numerous forms appear to connect this plant with the arborescent form of the north and of the Santa Lucia Mountains in the south, and its shrubby habit, small leaves, and more astringent fruit are perhaps the result of the peculiar climatic conditions to which it has been subjected.

[8] R. Brown (Campst.), *Trans. Bot. Soc. Edinburgh*, ix. 383.

[9] See ii. 94.

[10] Greene, *Garden and Forest*, iv. 243.

[11] *Prunus emarginata* was probably introduced into Scotch gardens by the Scotch collector John Jeffrey in 1851 or 1852, as at that time he sent the seeds of many of the plants of our northwestern coast to the members of the so-called Oregon Expedition, whose agent he was. It was sent from the Edinburgh Botanic Garden to the Muséum d'Histoire Naturelle in Paris in 1865, as *Prunus Pattoniana*, a name which does not appear to have been published (Carrière, *Rev. Hort.* 1872, 135).

EXPLANATION OF THE PLATE.

PLATE CLVII. PRUNUS EMARGINATA.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. Vertical section of a fruit, enlarged.
5. A stone, enlarged.
6. Part of a leafy branch showing stipules, natural size.
7. A winter branchlet, natural size.

C E. Faxon del. Picart fr. sc.

PRUNUS EMARGINATA, Walp.

A. Riocreux dirext Imp. R. Taneur, Paris.

PRUNUS VIRGINIANA.

Choke Cherry. Wild Cherry.

CALYX-LOBES deciduous. Stone oblong-ovate, pointed. Leaves broadly oval to oblong-obovate, usually abruptly acuminate.

Prunus Virginiana, Linnæus, *Spec.* 473 (excl. syn.). — Willdenow, *Berl. Baumz.* 238, t. 5, f. 1; *Spec.* ii. pt. ii. 985; *Enum.* 517. — Desfontaines, *Hist. Arb.* ii. 203. — Persoon, *Syn.* ii. 34. — Hayne, *Dendr. Fl.* 70. — Guimpel, Otto & Hayne, *Abbild. Holz.* 43, t. 36. — Sprengel, *Syst.* ii. 478. — Dietrich, *Syn.* iii. 42. — Torrey, *Bot. Mex. Bound. Surv.* 62. — Koch, *Dendr.* i. 121. — Chapman, *Fl.* 120. — Watson, *King's Rep.* v. 80. — Emerson, *Trees Mass.* ed. 2, ii. 518, t. — Brewer & Watson, *Bot. Cal.* i. 167. — Watson & Coulter, *Gray's Man.* ed. 6, 152.

Padus rubra, Miller, *Dict.* ed. 8, No. 2.

Prunus nana, Du Roi, *Harbk. Baumz.* ii. 194, t. 4.

Prunus-Cerasus Canadensis, Marshall, *Arbust. Am.* 113.

Prunus rubra, Aiton, *Hort. Kew.* ii. 162. — Willdenow, *Berl. Baumz.* ed. 2, 299. — Guimpel, Otto & Hayne, *Abbild. Holz.* 98, t. 78.

Padus oblonga, Moench, *Meth.* 671.

Prunus serotina, Poiret, *Lam. Dict.* v. 665 (not Ehrhart). — Pursh, *Fl. Am. Sept.* i. 330. — Elliott, *Sk.* i. 541. — Torrey, *Fl. N. Y.* i. 196.

Cerasus Virginiana, Loiseleur, *Nouveau Duhamel*, v. 3 (excl. syn. Michaux). — De Candolle, *Prodr.* ii. 539. — Spach, *Hist. Vég.* i. 414. — Torrey & Gray, *Fl. N. Am.* i. 410. — Torrey, *Fl. N. Y.* i. 196; *Nicollet's Rep.* 149; *Frémont's Rep.* 89; *Emory's Rep.* 408; *Pacific R. R. Rep.* iv. 83. — Emerson, *Trees Mass.* 456. — Gray, *Man.* 115; *Pacific R. R. Rep.* xii. pt. ii. 42. — Darlington, *Fl. Cestr.* ed. 3, 74. — Cooper, *Pacific R. R. Rep.* xii. pt. ii. 30; *Am. Nat.* iii. 406.

Prunus hirsuta, Elliott, *Sk.* i. 541.

Prunus obovata, Bigelow, *Fl. Boston.* ed. 2, 192.

Cerasus serotina, Hooker, *Fl. Bor.-Am.* i. 169 (excl. syn.; not Loiseleur). — Don, *Gen. Syst.* ii. 515.

Cerasus obovata, Beck, *Bot.* 97. — Eaton & Wright, *Bot.* 189.

Cerasus micrantha, Spach, *Hist. Vég.* i. 414.

Cerasus densiflora, Spach, *Hist. Vég.* i. 415.

Cerasus fimbriata, Spach, *Hist. Vég.* i. 416.

Cerasus hirsuta, Spach, *Hist. Vég.* i. 417. — Eaton & Wright, *Bot.* 190.

Cerasus Virginiana, var. β. Torrey & Gray, *Fl.* i. 410.

Cerasus Duerinckii, Martens, *Sel. Sem. Hort. Lovan.* 1840; *Bull. Bot. Soc. Brux.* viii. 68.

Prunus Duerinckii, Walpers, *Rep.* ii. 10.

Padus fimbriata, Roemer, *Fam. Nat. Syn.* iii. 84.

Padus densiflora, Roemer, *Fam. Nat. Syn.* iii. 84.

Padus micrantha, Roemer, *Fam. Nat. Syn.* iii. 84.

Padus obovata, Roemer, *Fam. Nat. Syn.* iii. 86.

Padus hirsuta, Roemer, *Fam. Nat. Syn.* iii. 87.

A tree, with strong-scented bark[1] and leaves, rarely thirty to thirty-five feet in height, with a short and often crooked or inclining trunk sometimes a foot in diameter, small erect or horizontal branches, and stout branchlets which form a narrow irregular head; or more often a low shrub. The bark of the trunk is an eighth of an inch thick, slightly and irregularly fissured, broken on the surface into small persistent scales, and often marked by irregular pale excrescences. The branches, when they first appear, are light brown, or bronze-green, and glabrous, puberulous, or sometimes pubescent, and in their first winter are light brown or brown tinged with red and marked with large oblong lenticels; in their second year they become darker brown, and the tough outer layer of bark is easily separable in horizontal strips from the bright green inner layers. The winter-buds are acute or obtuse and are covered by pale chestnut-brown scales, more or less scarious on the margins and rounded at the apex, those of the inner rank accrescent, lanceolate or ligulate, sharply and often glandular-serrate, chartaceous, and from half an inch to an inch in length. The leaves are broadly oval or more or less oblong-obovate, usually abruptly acuminate at the apex, wedge-shaped, rounded or subcordate at the base, and sharply and often deeply serrate with subulate spreading teeth; when they unfold they are glabrous with the excep-

[1] The strong disagreeable odor of the inner bark of the branches of this species affords the best character for distinguishing it in winter from *Prunus serotina*, the inner bark of which has an aromatic and rather agreeable perfume. The branches of the former are usually much stouter than those of the latter.

tion of conspicuous tufts of pale hairs in the axils of the principal veins on the lower surface, or are puberulous or pubescent; at maturity they are membranaceous, bright green above, paler and sometimes pubescent below, two to four inches in length and an inch to two inches broad, and are borne on slender grooved petioles biglandular near the apex, or sometimes, especially on vigorous shoots, many-glandular. The stipules are lanceolate, acute, glandular-serrate, half an inch long, and early deciduous. The leaves turn yellow in the autumn some time before falling. The flowers, which are from one third to one half of an inch in diameter, appear from the first of April in the south to the end of June at the extreme north; they are borne on slender glabrous or puberulous pedicels produced from the axils of scarious caducous bracts in slender many-flowered erect or nodding racemes three to six inches long. The calyx-tube is cup-shaped, glabrous or rarely puberulous, with short broad obtuse reflexed deciduous lobes, laciniate or more or less glandular on the margins. The petals are pure white, orbicular, and contracted below into short claws. The filaments and pistil are glabrous, and the short thick style is abruptly enlarged into a broad orbicular stigma. The fruit, which varies from one fourth to one third of an inch in diameter, is globose or occasionally somewhat elongated, bright red when first fully grown, and when perfectly ripe is dark vinous red or almost black, or rarely yellow or amber-colored,[1] with a thick lustrous skin, dark juicy flesh, and an oblong-ovate stone, broadly ridged on one margin and acute on the other. In early autumn the fruit is austere and astringent, but later loses much of its astringency and becomes sweet and edible.[2]

Prunus Virginiana is the most widely distributed North American tree; it grows within the arctic circle,[3] ranging across the continent from Labrador and the shores of Hudson's Bay to the valley of the Mackenzie River in latitude 62°, and, crossing the Rocky Mountains, reaches the Pacific coast in northern British Columbia;[4] it extends southward through eastern North America to southern Georgia, Louisiana, Texas, northern Mexico,[5] and along the mountain ranges of western North America. In the eastern states it is one of the most common of the large tree-like shrubs, growing usually on the margins of the forest, generally in rich rather humid soil, and along highways and fence-rows; in southern Oregon and northern California it inhabits low valleys where, in rich moist soil in the neighborhood of streams, it attains a large size and arborescent habit; on the mountain ranges of the interior of the continent, where it is confined to elevated valleys, in southern California, and at the northern and southern limits of its range, it is a low shrub.

The wood[6] of *Prunus Virginiana* is heavy, hard, and close-grained, although not strong; it contains numerous conspicuous medullary rays, and is light brown, with thick lighter colored sapwood composed of fifteen to twenty layers of annual growth. The specific gravity of the absolutely dry wood is 0.6951, a cubic foot weighing 43.32 pounds.

[1] A yellow-fruited form of *Prunus Virginiana* (var. *leucocarpa*, Watson, *Bot. Gazette*, xiii. 233) was found in Dedham, Massachusetts, a few years ago; and plants with light-colored fruit are sometimes cultivated in Canadian gardens, and in those of northern Europe (J. G. Jack, *Garden and Forest*, v. 135).

[2] The western Choke Cherry has usually been considered a species. Extreme forms, especially those of the mid-continental regions, vary slightly from the eastern plant in the shape of their leaves, which are more often rounded or subcordate than cuneate at the base, and are sometimes pale on the lower surface, in their more abundant and persistent pubescence, and their greater thickness and consistency. It is not easy, however, to find stable characters upon which to establish even a geographical variety; for the extreme forms pass insensibly one into the other, showing the gradual influence of a dry climate in increasing the thickness and the hairy covering of leaves. The synonymy of the western plant is as follows: —

Prunus demissa, Walpers, *Rep.* ii. 10. — Dietrich, *Syn.* iii. 43. — Bentham, *Pl. Hartweg.* 307. — Torrey, *Bot. Mex. Bound. Surv.* 63. — Watson, *King's Rep.* v. 80. — Rothrock, *Pl. Wheeler*, 37. — Brewer & Watson, *Bot. Cal.* i. 167. — Macoun, *Cat. Can. Pl.* i. 125. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 69. — Greene, *Fl. Francis.* 51. — T. S. Brandegee, *Zoë*, ii. 157. — Bessey, *Bull. Agric. Exper. Stat. Nebraska*, iv. art. iv. 18.

Cerasus serotina, Hooker, *Fl. Bor.-Am.* i. 169 (in part).

Cerasus demissa, Nuttall; Torrey & Gray, *Fl. N. Am.* i. 411. — Torrey, *Pacific R. R. Rep.* iv. 83. — Newberry, *Pacific R. R. Rep.* vi. 73. — Cooper, *Pacific R. R. Rep.* xii. pt. ii. 59.

Padus demissa, Roemer, *Fam. Nat. Syn.* iii. 87.

Prunus Virginiana, var. *demissa*, Torrey, *Bot. Wilkes Explor. Exped.* 284. — Gray, *Proc. Am. Acad.* viii. 381.

[3] Hooker f. *Trans. Linn. Soc.* xxiii. 290 (*Distribution Arctic Pl.*).

[4] Macoun, *Cat. Can. Pl.* i. 125.

[5] Hemsley, *Bot. Biol. Am. Cent.* i. 368.

[6] The specimen of wood tested in the United States Census investigation was taken from a tree grown in southern Oregon.

In Canada the fruit, which is gathered in great quantities and is sold in the markets of the large cities, is eaten by the French Canadians, and was formerly an important article of food among the northern Indians,[1] as well as among those inhabiting the western and central parts of the continent.

Prunus Virginiana early attracted the attention of European colonists,[2] although it does not appear to have been introduced into European gardens until the middle of the eighteenth century.

The Choke Cherry is a handsome plant when it is covered with its abundant racemes of pure white flowers; but it is generally disfigured by the Black Knot, which makes it a dangerous neighbor to orchards of cultivated Plum-trees.

[1] Richardson, *Arctic Searching Exped.* ii. 190.

[2] "The Cherrie trees yeeld great store of Cherries, which grow on clusters like grapes; they be much smaller than our *English* Cherrie, nothing neare so good if they be not very ripe; they so furre the mouth that the tongue will cleave to the roofe, and the throate wax horse with swallowing those red Bullies (as I may call them), being little better in taste. English ordering may bring them to be an English Cherrie, but yet they are as wilde as the Indians." (Wood, *New England's Prospect*, pt. i. chap. 5, 18.)

EXPLANATION OF THE PLATE.

PLATE CLVIII. PRUNUS VIRGINIANA (FROM OREGON).

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. Vertical section of a fruit, enlarged.
5. A stone, enlarged.
6. Part of a leafy branch with stipules, natural size.
7. A winter branchlet, natural size.

C.E. Faxon del. Picart fr. sc.

PRUNUS VIRGINIANA, L.

A. Riocreux direx.t Imp. R. Taneur, Paris.

PRUNUS SEROTINA.

Rum Cherry. Wild Black Cherry.

CALYX-LOBES persistent. Stone oblong-obovate. Leaves oblong to lanceolate-oblong, usually gradually acuminate.

Prunus serotina, Ehrhart, *Beitr.* iii. 20. — Willdenow, *Berl. Baumz.* 239, t. 5, f. 2; *Spec.* ii. pt. ii. 986; *Enum.* 517. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 531. — Persoon, *Syn.* ii. 34. — Desfontaines, *Hist. Arb.* ii. 204. — Nuttall, *Gen.* i. 302. — W. P. C. Barton, *Compend. Fl. Phil.* i. 222. — Guimpel, Otto & Hayne, *Abbild. Holz.* 45, t. 37. — Hayne, *Dendr. Fl.* 70. — Sprengel, *Syst.* ii. 478. — Dietrich, *Syn.* iii. 43. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 56. — Chapman, *Fl.* 120. — Koch, *Dendr.* i. 122. — Emerson, *Trees Mass.* ed. 2, ii. 515, t. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 66. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 68. — Watson & Coulter, *Gray's Man.* ed. 6, 152.

Prunus Virginiana, Miller, *Dict.* ed. 8, No. 3 (not Linnæus). — Du Roi, *Obs. Bot.* 12; *Harbk. Baumz.* ii. 191. — Wangenheim, *Nordam. Holz.* 34, t. 14. — Medicus, *Bot. Beob.* 1782, 345. — Marshall, *Arbust. Am.* 112. — Aiton, *Hort. Kew.* ii. 163. — Walter, *Fl. Car.* 146. — Poiret, *Lam. Dict.* v. 664. — Pursh, *Fl. Am. Sept.* i. 329. — Bigelow, *Fl. Boston.* 118. — Elliott, *Sk.* i. 540. — Torrey, *Fl. U. S.* 467.

Cerasus Virginiana, Michaux, *Fl. Bor.-Am.* i. 285. — Michaux f. *Hist. Arb. Am.* iii. 151, t. 6. — Darlington, *Fl. Cestr.* 61. — Hooker, *Fl. Bor.-Am.* i. 169 (excl. syn.). — Don, *Gen. Syst.* ii. 515. — Loudon, *Arb. Brit.* ii. 710, f. 418.

Cerasus serotina, Loiseleur, *Nouveau Duhamel*, v. 3. — De Candolle, *Prodr.* ii. 540. — Spach, *Hist. Vég.* i. 416. — Torrey & Gray, *Fl. N. Am.* i. 410. — Loudon, *Arb. Brit.* ii. 712, f. 419. — Torrey, *Fl. N. Y.* i. 196. — Emerson, *Trees Mass.* 453. — Gray, *Man.* 115; *Forest Trees N. Am.* t. 50. — Darlington, *Fl. Cestr.* ed. 3, 75.

Prunus cartilaginea, Lehmann, *Ind. Sem. Hamb.* 1833.

Padus serotina, Agardh, *Theor. Syst. Pl.* t. 14, f. 8.

Padus Virginiana, Roemer, *Fam. Nat. Syn.* iii. 86.

Padus cartilaginea, Roemer, *Fam. Nat. Syn.* iii. 86.

A tree, with bitter aromatic bark and leaves, sometimes attaining a height of one hundred feet, with a stout straight trunk four to five feet in diameter, and small horizontal branches which form a narrow oblong head; usually much smaller and occasionally, toward the northern limit of its range, of shrub-like habit. On fully grown trunks the bark varies from one half to three quarters of an inch in thickness and is broken by reticulated fissures into small irregular plates, the surface of which splits into thin persistent scales; it is dark red-brown, or in southern Florida and the coast region of the Gulf states is light gray. The branches are slender and rather rigid, and at first are pale green or bronze-green and glabrous; they soon turn bright red or dark brown tinged with red, and in their first winter are red-brown or gray-brown and marked by minute pale lenticels. In the second year the thin tough layer of outer bark is bright red and more conspicuously marked, and may be separated readily in horizontal bands from the brilliant green inner layer. The winter-buds are obtuse or on sterile shoots acute, and are covered with bright chestnut-brown broadly ovate scales keeled on the back and apiculate at the apex; those of the inner ranks are persistent on the growing shoots scarious at maturity, acuminate, and from one half to two thirds of an inch in length. The leaves are oval, oblong, or lanceolate-oblong, gradually or sometimes abruptly acuminate, or rarely rounded at the apex, wedge-shaped, or occasionally rounded at the base, finely serrate with appressed incurved callose teeth, and furnished at the very base of the blade or at the apex of the slender terete petioles with one or more dark red conspicuous glands; while young they are slightly bearded along the midribs on the lower surface, and are often bronze-green, and at maturity they are glabrous, subcoriaceous, dark green, and lustrous on the upper, and paler on the lower surface, two to five inches long, and an inch to an inch and half broad, with narrow conspicuous midribs deeply grooved on the upper side, and slender veins. The stipules are lanceolate, acuminate, glandular-serrate, from one half to three fourths of an inch in length, and early deciduous. In autumn the leaves turn clear bright yellow before falling. The flowers, which are

produced on slender glabrous or puberulous pedicels developed from the axils of minute scarious caducous bracts, are borne in erect or ultimately spreading narrow many-flowered racemes, four to six inches in length, and appear when the leaves are about half grown, from the end of March in Texas and Louisiana to the first week of June in the valley of the St. Lawrence River. They are a quarter of an inch across when expanded, with a cup-shaped glabrous or puberulous calyx-tube and short ovate-oblong obtuse lobes, slightly laciniate on the margins, reflexed at maturity, and persistent with the stamens until after the falling of the fruit, pure white, broadly obovate petals, glabrous filaments and pistil, and a thick club-shaped stigma. The fruit, which ripens from June to October, is depressed-globular, slightly lobed, from one third to one half of an inch in diameter, dark red when first fully grown and almost black when ripe, with a thick skin, dark purple juicy flesh of a pleasant vinous flavor, and oblong-obovate pointed thin-walled stones broadly ridged on the ventral margin and acute on the other.

Prunus serotina is distributed from Nova Scotia westward through the Canadian Provinces to the valley of the Kaministiquia River,[1] southward through the eastern states to the shores of Matanzas Inlet and Tampa Bay, Florida, and westward to the valley of the Missouri River in Dakota, eastern Nebraska and Kansas, the Indian Territory and eastern Texas, along the mountain ranges of western Texas, southern New Mexico, and Arizona, and on those of Mexico and the Pacific regions of Central America, Colombia, and Peru. In the United States *Prunus serotina* grows usually in rich moist soil, and was once common in all the Appalachian region, where, associated with the White Oak, the White Ash, the Blue Ash, the Sugar Maple, the Yellow Buckeye, the Hickories, and the Black Birch, it was an important element of the forest, reaching its greatest size and beauty on the slopes of the high Alleghany Mountains from West Virginia to Georgia and Alabama; sometimes it grows on light sandy soil, and it may be found on the rocky cliffs of the New England coast within reach of the spray of the ocean; in the coast region of the southern states it is nowhere common, and does not attain a large size; and in the southwest it is confined to the bottoms of mountain cañons, at elevations between five thousand and seven thousand feet about the level of the sea, and rarely grows to a greater height than twenty or thirty feet.[2]

Prunus serotina is one of the most valuable timber trees of the American forests. The wood is light, strong, and rather hard, with a close straight grain and a satiny surface susceptible of receiving a beautiful polish; it is light brown or red, with thin yellow sapwood composed of ten or twelve layers of

[1] Brunet, *Cat. Pl. Can.* 43. — Delamare, Renauld & Cardot, *Fl. Miquelon.* 18. — Macoun, *Cat. Can. Pl.* i. 126, 513.

[2] Botanists have usually considered the Mexican Cherry-tree a distinct species, but it is impossible to find essential characters to distinguish it from the northern species with which it is connected geographically through Arizona, New Mexico, and Texas. The leaves of the Mexican tree are often narrowly lanceolate and acuminate, but this character is by no means constant, and leaves of a similar form are not uncommon on northern trees. The persistent calyx-lobes which distinguish *Prunus serotina* from the other species of the section Padus are found on the southern as well as on the northern trees. The synonymy of the Mexican Cherry-tree is as follows: —

Prunus salicifolia, Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 241, t. 563. — Kunth, *Syn. Pl. Æquin.* iii. 481. — Sprengel, *Syst.* ii. 478. — Hemsley, *Bot. Biol. Am. Cent.* i. 368.

Cerasus Capollin, De Candolle, *Prodr.* ii. 539. — Don, *Gen. Syst.* ii. 515. — Loudon, *Arb. Brit.* ii. 713, f. 420. — Bentham, *Pl. Hartweg.* 10. — Torrey & Gray, *Fl. N. Am.* i. 412. — Gray, *Smithsonian Contrib.* v. 54 (*Pl. Wright.* ii.).

Cerasus salicifolia, De Candolle, *Prodr.* ii. 540. — Spach, *Hist. Vég.* i. 422. — Don, *Gen. Syst.* ii. 516.

Cerasus Capuli, Seringe; De Candolle, *Prodr.* ii. 541. — Don, *Gen. Syst.* ii. 516. — Spach, *Hist. Vég.* i. 422.

Prunus Capuli, Cavanilles; Sprengel, *Syst.* ii. 477. — Schlechtendal, *Linnæa*, xiii. 89, 404. — Koch, *Dendr.* i. 123. — Hemsley, *Bot. Biol. Am. Cent.* i. 367. — Watson, *Proc. Am. Acad.* xvii. 352.

Prunus Capulin, Zuccarini, *Abhand. Akad. Münch.* ii. 345, t. 8. — Roemer, *Fam. Nat. Syn.* iii. 87. — Torrey, *Bot. Mex. Bound. Surv.* 62. — Rusby, *Bull. Torrey Bot. Club*, ix. 53.

Prunus Canadensis, Mocino & Sessé, *Pl. Mex. Icon.* ined.

Laurocerasus salicifolia, Roemer, *Fam. Nat. Syn.* iii. 89.

Prunus salicifolia, var. *acutifolia*, Watson, *Proc. Am. Acad.* xxii. 411.

As is generally the case with individual trees grown in dry climates, the wood of the New Mexican Cherry is considerably heavier than the average of several specimens from trees which had grown in other parts of the United States, the specific gravity of the absolutely dry wood being 0.7879, and a cubic foot weighing 49.10 pounds. The Mexican Cherry is supposed to be an inhabitant of French gardens (*Rev. Hort.* 1884, 111; 1891, 62, f. 19, 20; 196. — Lavallée, *Arb. Segrez.* 115, t. 34), but as the plants which resemble in every respect the Wild Cherries of the east are perfectly hardy in the neighborhood of Paris and in the Arnold Arboretum, which received them from France, they are probably of more northern origin than the French horticulturists believe. In the elevated regions of western South America the Mexican Cherry is occasionally planted as a fruit-tree in the neighborhood of dwellings (Ed. André, *L'Amérique Equinoxiale* [*Le Tour du Monde*, xxxiv. 46]).

annual growth, but grows darker with exposure to the air. The specific gravity of the absolutely dry wood is 0.5822, a cubic foot weighing 36.28 pounds; the wood of no other North American tree is better colored or more valuable for cabinet-making and the fine interior finish of houses, and the great demand for it for these purposes has caused the destruction of the largest and best trees in all parts of the country.

The bark of the Wild Cherry, which contains the bitter principle [1] peculiar to plants of this genus, yields hydrocyanic acid when steeped in cold water, and, especially that of the branches and roots, is much employed in medicine for infusions, syrups, and fluid extracts, which are used as tonics and sedatives in the treatment of pulmonary consumption and nervous debility.[2] The ripe fruit is used domestically to flavor alcoholic liquors; and under the name of capulinos it is sold in the markets of Mexico and Central America, where it is eaten fresh or preserved, and is fermented and manufactured into a liquor similar to kirschwasser.[3]

The records of several early voyagers to the New World mention the Wild Cherry,[4] and, being established in English gardens before 1629, as John Parkinson records in his *Paradisi in Sole Paradisus terrestris*, it was one of the first American trees cultivated in Europe.[5]

With its tall massive trunk, lustrous foliage, abundant and graceful inflorescence, and handsome fruit, the Wild Cherry is one of the stateliest and most beautiful trees of the eastern woods; and its hardiness and ability to thrive under varied climatic conditions and in different soils, its rapid growth, and the value of the timber it produces, commend it to the attention of the planters of forests.[6]

[1] Procter, *Am. Jour. Pharm.* iv. 197. — Perot, *Am. Jour. Pharm.* xxiv. 750.

[2] B. S. Barton, *Coll.* ed. 3, 11, pt. ii. 51. — Griffith, *Med. Bot.* 288. — Carson, *Med. Bot.* i. 41, t. 35. — Bentley, *Pharm. Jour.* v. 97. — Gobley, *Jour. Pharm. et Chim.* xv. 40. — Guibourt, *Hist. Drog.* ed. 7. iii. 317. — Flückiger & Hanbury, *Pharmacographia*, 224. — *U. S. Dispens.* ed. 14, 749. — *Nat. Dispens.* ed. 2, 1177. — Bentley & Trimen, *Med. Pl.* ii. 97, t. 97. — Laurence Johnson, *Man. Med. Bot. N. A.* 135, f. 122. — Maisch, *Organic Mat. Med.* ed. 4, 184.

[3] Hamelin, *Rev. Hort.* 1884, 111.

[4] "It naturally yeelds mulberry-trees, cherry-trees, vines aboundance; goosberyes, strawberyes, hurtleberyes, respesses." (*A Relatyon of the discovery of our river from James Forte into the Maine; made by Capt. Christopher Newport, and seveerely written and observed by a gentleman of the colony. Archæologia Americana*, iv. 61 [1607].)

De Capolin, seu Ceraso dulci Indica, Francisco Hernandez, *Hist. Pl. Nov. Hisp.* ed. Madrid, 1790, ii. lib. vi. cap. lxxviii.

De Capolin seu ceraso dulci, Nieremberg, *Hist. Nat.* lib. xv. cap. xxi. 343 (cum icone, p. 344).

"The indigenous fruits consist . . . of mulberries, plums, but not many, medlars, wild cherries." (*Representation from New-Nether-Land, concerning the Situation, Fruitfulness, and poor Condition of the same.* English ed. Henry C. Murphy, 15.)

"*Wild Cherry*, they grow in clusters like Grapes, of the same bigness, blackish red when ripe, and of a harsh taste." (Josselyn, *New England's Rarities*, 61.)

[5] *Laurea Cerasus, sive laurus Virginiana*, the Virginian Bay or Cherry Bay, 599, t., f. 6.

Cerasus racemosa, foliis Amygdalinis, Americana, Plukenet, *Phyt.* t. 158, f. 4; *Alm. Bot.* 95.

Cerasus sylvestris, fructu nigricante in racemis longis pendulis Phytolaccæ instar congestis, Clayton, *Fl. Virgin.* 54. — Royen, *Fl. Leyd. Prodr.* 537. — Duhamel, *Traité des Arbres*, i. 148.

[6] Sargent, *Rep. Sec. Board Agric. Mass.* xxv. 269. — Naudin, *Manuel de l'Acclimateur*, 198.

EXPLANATION OF THE PLATE.

PLATE CLIX. PRUNUS SEROTINA.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. Vertical section of a fruit, enlarged.
5. Cross section of a fruit, enlarged.
6. A stone, enlarged.
7. Portion of a leafy branch showing stipules, natural size.
8. A winter branchlet, natural size.

C.E Faxon del. Picart fr. sc.

PRUNUS SEROTINA, Ehrh.

A. Riocreux direx.t Imp. R. Taneur, Paris.

PRUNUS CAROLINIANA.

Wild Orange. Mock Orange.

CALYX-LOBES rounded at the apex, with undulate margins. Stone broadly ovate, cylindrical. Leaves oblong-lanceolate, entire or rarely remotely spinulose-serrate.

Prunus Caroliniana, Aiton, *Hort. Kew.* ii. 163. — Willdenow, *Spec.* ii. pt. ii. 987. — Poiret, *Lam. Dict.* v. 667. — Persoon, *Syn.* ii. 34. — Desfontaines, *Hist. Arb.* ii. 203. — Nuttall, *Gen.* i. 302. — Sprengel, *Neue Entd.* i. 304; *Syst.* ii. 478. — Hayne, *Dendr. Fl.* 71. — Elliott, *Sk.* i. 540. — Audubon, *Birds*, t. 159, 190. — Schlechtendal, *Linnæa*, xiii. 89. — Dietrich, *Syn.* iii. 43. — Chapman, *Fl.* 120. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 57. — Koch, *Dendr.* i. 124. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 69.

Padus Caroliniana, Miller, *Dict.* ed. 8, No. 6.

Padus Carolina, Du Roi, *Harbk. Baumz.* ii. 198.

Prunus-Lauro-Cerasus serratifolia, Marshall, *Arbust. Am.* 114.

Prunus Lusitanica, Walter, *Fl. Car.* 146 (not Linnæus).

Prunus Lusitanica, var. **serratifolia**, Castiglioni, *Viag. negli Stati Uniti*, ii. 340.

Cerasus Caroliniana, Michaux, *Fl. Bor.-Am.* i. 285. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 532. — *Nouveau Duhamel*, v. 5. — Michaux, *Hist. Arb. Am.* iii. 156, t. 7. — De Candolle, *Prodr.* ii. 540. — Don, *Gen. Syst.* ii. 516. — Spach, *Hist. Vég.* i. 420. — Loudon, *Arb. Brit.* ii. 720, f. 423. — Torrey & Gray, *Fl. N. Am.* i. 411.

Prunus sempervirens, Willdenow, *Enum.* Suppl. 33.

? Bumelia serrata, Pursh, *Fl. Am. Sept.* i. 155. — Roemer & Schultes, *Syst.* iv. 498.

? Achras serrata, Poiret, *Lam. Dict.* Suppl. v. 36.

Chimanthus amygdalina, Rafinesque, *Fl. Ludovic.* 26.

Laurocerasus Caroliniana, Roemer, *Fam. Nat. Syn.* iii. 90.

A tree, thirty to forty feet in height, with a straight or inclining trunk sometimes ten or twelve inches in diameter, and small horizontal branches forming a rather narrow oblong or sometimes a broadly spreading head. The bark of the trunk is an eighth of an inch thick, and smooth or slightly roughened by narrow longitudinal ridges, and is gray, with large irregular dark blotches. The branches are glabrous and marked by occasional pale lenticels, slightly angled, at first light green, then bright red, and in their second season light brown or gray. The buds are acuminate, an eighth of an inch long, and covered with narrow-pointed dark chestnut-brown scales rounded on the back. The leaves, which are persistent on the branches until their second year, are oblong-lanceolate, acuminate and mucronate, with entire thickened slightly revolute margins, or are rarely remotely spinulose-serrate; they are glabrous, coriaceous, and obscurely veined, with narrow pale midribs deeply grooved on the upper side, dark green and lustrous on the upper, and paler on the lower surface, two to four and a half inches long, and three quarters of an inch to an inch and a half broad, and are borne on stout broad orange-colored channeled petioles. The stipules are foliaceous, lanceolate-acuminate, and early deciduous. The flowers appear from February to April and are produced, in dense racemes shorter than the leaves, on slender club-shaped pedicels from the axils of long acuminate scarious red-tipped bracts; these mostly fall some time before the opening of the flowers, which are cream-colored, and have a narrow obconic calyx-tube with small thin rounded deciduous lobes undulate on the margins and reflexed after anthesis, minute erect boat-shaped petals, exserted orange-colored stamens with glabrous filaments, large pale anthers, and a glabrous pistil and club-shaped stigma. The fruit ripens in the autumn and remains on the branches until after the flowering period of the following year; it is oblong, short-pointed, black, and lustrous, and half an inch long, with a thick skin, thin dry flesh, and a broadly ovate pointed cylindrical stone which has an obscure or rudimentary ridge on the ventral margin, and thin fragile walls. The coat of the seed is thin and papery and dark red-brown like the cotyledons which inclose the short radicle.

Prunus Caroliniana inhabits the southern coast region, and is distributed from the valley of the

Cape Fear River to the shores of Bay Biscayne and the valley of the Kissimmee River in Florida, and through southern Alabama, Missouri, and Louisiana to the valley of the Guadaloupe River in Texas. It grows in deep rich humid bottom-lands, reaching its greatest size in the valleys of eastern Texas, where it often forms nearly impenetrable thickets of considerable size; in the eastern Gulf and Atlantic states it is nowhere common and is confined to the islands and the immediate neighborhood of the sea, rarely penetrating inland more than fifteen or twenty miles.

The wood of *Prunus Caroliniana* is heavy, hard, strong, and close-grained; it is light red-brown or sometimes rich dark brown, with thick lighter colored sapwood, a satiny surface susceptible of receiving a beautiful polish, and many thin medullary rays. The specific gravity of the absolutely dry wood is 0.8688, a cubic foot weighing 54.14 pounds.

Prunus Caroliniana contains hydrocyanic acid in considerable quantities, and the partially withered leaves and young branches have proved fatal to animals browsing upon them.[1]

Prunus Caroliniana was first described by Mark Catesby in his *Natural History of Carolina*,[2] published in 1731, and was first cultivated in Europe in the Physic Garden at Chelsea by Philip Miller, who received it from Catesby in 1759.[3]

The beauty of the foliage[4] of the Mock Orange, its early and abundant flowers, and the rapidity of its growth, make it a favorite garden plant in the southern states, where it has been used from early times to decorate the neighborhood of dwellings, and to form hedges, for which purpose it is well adapted by its rigid leaves and its power of withstanding the effects of annual prunings.[5]

[1] Elliott, *Sk.* i. 540.

[2] *Ligustrum Lauri folio, fructu violaceo*, i. 61, t. 61.

Padus foliis lanceolatis acutè denticulatis sempervirentibus, Miller, *Dict.* ed. 7, No. 6.

[3] Aiton, *Hort. Kew.* ii. 163.

[4] "There is an evergreen sort of this Bird or Cluster-cherry which grows about 30 feet high in S. Carolina, and from the beauty of its evergreen shining leaves is called the Mock-orange; the fruit of this steeped in brandy makes a fine flavoured ratafie." (Stork, *An Account of East Florida, Bartram's Journal*, 9, note.)

[5] Porcher, *Resources of Southern Fields and Forests*, 171. — Naudin, *Manuel de l'Acclimateur*, 197.

EXPLANATION OF THE PLATE.

Plate CLX. Prunus Caroliniana.

1. A flowering and fruiting branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. Vertical section of a fruit, natural size.
5. Cross section of a fruit, natural size.
6. An embryo, enlarged.
7. Vertical section of a portion of the embryo, showing the radicle, enlarged.
8. A stone, enlarged.
9. The inflorescence before anthesis, showing the bracts, natural size.
10. A spinulose-toothed leaf, natural size.

C.E.Faxon del. Picart fr sc

PRUNUS CAROLINIANA, Ait.

A.Riocreux dirext Imp. R. Taneur, Paris.

PRUNUS SPHÆROCARPA.

CALYX-LOBES acute, with laciniate margins. Stone globose. Leaves elliptical to oblong-ovate, entire.

Prunus sphærocarpa, Swartz, *Prodr.* 81; *Fl. Ind. Occ.* ii. 927. — Willdenow, *Spec.* ii. pt. ii. 987. — Poiret, *Lam. Dict.* v. 666. — Persoon, *Syn.* ii. 34. — Lunan, *Hort. Jam.* ii. 276. — Don, *Gen. Syst.* ii. 516. — Dietrich, *Syn.* iii. 43. — Sprengel, *Syst.* ii. 478; iv. pt. ii. 406. — Schlechtendal, *Linnæa*, xiii. 87. — Walpers, *Rep.* ii. 10. — Grisebach, *Fl. Brit. W. Ind.* 231. — Hooker f. *Martius Fl. Brasil.* xiv. pt. ii. 55, t. 19. — Sauvalle, *Fl. Cub.* 36. — Chapman, *Fl.* ed. 2, Suppl. 620. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 70.

Cerasus sphærocarpa, Loiseleur, *Nouveau Duhamel*, v. 4. — De Candolle, *Prodr.* ii. 540. — Chamisso & Schlechtendal, *Linnæa*, ii. 542. — Loudon, *Arb. Brit.* ii. 721. — *Bot. Mag.* t. 3141. — Spach, *Hist. Vég.* i. 421.

Prunus Brasiliensis, Steudel, *Nom. Bot.*

Cerasus Brasiliensis, Chamisso & Schlechtendal, *Linnæa*, ii. 540.

Cerasus reflexa, Gardner, *Lond. Jour. Bot.* ii. 342.

Laurocerasus sphærocarpa, Roemer, *Fam. Nat. Syn.* iii. 89.

Laurocerasus sphærocarpa, *β.* **Brasiliensis**, Roemer, *Fam. Nat. Syn.* iii. 89.

Prunus pleuradenia, Grisebach, *Fl. Brit. W. Ind.* 231.

A small glabrous tree, in Florida rarely exceeding twenty-five to thirty feet in height, with a trunk five or six inches in diameter covered with thin smooth or slightly reticulate-fissured light brown bark tinged with red, and slender upright branches and branchlets. These, when they first appear, are orange-brown but become ashy gray or light brown tinged with red, and are covered with small circular pale lenticels. The leaves are elliptical to oblong-ovate, gradually or abruptly contracted into broad obtuse points or less commonly rounded or rarely emarginate at the apex, wedge-shaped at the base, entire, with slightly thickened undulate margins, eglandular, obscurely veined, with narrow midribs deeply grooved on the upper side; they are persistent, subcoriaceous, yellow-green and lustrous on the upper, and paler on the lower surface, two to four and a half inches long and an inch to an inch and a half broad, and are borne on slender orange-brown petioles which vary from one half of an inch to nearly an inch in length. The stipules are foliaceous, lanceolate-acuminate, entire, a quarter of an inch long, and early deciduous. The flowers are produced in slender many-flowered racemes shorter than the leaves and ebracteolate at the flowering period, and in Florida appear in November; they are one eighth of an inch across and are borne on slender orange-colored pedicels which stand remotely on the rachis and vary from one fourth to two thirds of an inch in length. The calyx-tube is obconic, bright orange-colored on the outer surface, and marked by an orange band in the throat, with thin minute acute deciduous lobes laciniate on the margins and much shorter than the petals, which are obovate, rounded, or acuminate above, contracted below into short claws, and reflexed at maturity, and are white marked with yellow on the inner surface towards the base. The stamens are exserted, and have slender orange-colored subulate filaments and small yellow anthers. The ovary is ovoid and contracted into a short stout style crowned with a large club-shaped stigma. The fruit, which in Florida is produced very sparingly and ripens either in the spring or early summer, is subglobose to oblong, apiculate, orange-brown, and from one third to one half of an inch long, with thin dry flesh adherent to the thin-walled fragile stone which is obscurely ridged on the ventral edge. The seed is pointed at the apex, with a thin dark orange-colored testa and thick cotyledons inclosing the short radicle.

Prunus sphærocarpa is found in the United States only near the shore of Bay Biscayne, where, west of the Miami River on rich hummock-land, it grows as a slender tree in a dense forest principally composed of the Mastic, the Gumbo Limbo, the Pigeon Plum, and the Florida Fig-tree, and occasionally

on low ground near the borders of small streams and ponds. It is not rare in the West Indies, and is widely distributed through Brazil.

The wood of *Prunus sphærocarpa* is heavy, hard, and close-grained, with obscure medullary rays and numerous minute open ducts, and is light clear red, with thick pale sapwood. The specific gravity of the absolutely dry wood is 0.8998, a cubic foot weighing 56.08 pounds. The fruit is used in the West Indies in the preparation of a cordial.[1]

Prunus sphærocarpa was first found in Florida in 1877 by Dr. A. P. Garber.[2]

[1] *Bot. Mag.* t. 3141. — Rosenthal, *Syn. Pl. Diaphor.* 979.

[2] See i. 65.

EXPLANATION OF THE PLATE.

PLATE CLXI. PRUNUS SPHÆROCARPA.

1. A flowering branch, natural size.
2. Vertical section of a flower just expanded, enlarged.
3. A fruiting branch, natural size.
4. Vertical section of a fruit, enlarged.
5. A seed, enlarged.
6. Part of a young leafy shoot showing stipules, natural size.

C E Faxon del.

Picart fr. sc.

PRUNUS SPHÆROCARPA, Sw.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

PRUNUS ILICIFOLIA.

Islay.

CALYX-LOBES acute, entire. Stone ovate, slightly compressed. Leaves ovate to lanceolate-acuminate, coarsely spinosely toothed or rarely entire.

Prunus ilicifolia, Walpers, *Rep.* ii. 10. — Dietrich, *Syn.* iii. 43. — Torrey, *Bot. Mex. Bound. Surv.* 63; *Bot. Wilkes Explor. Exped.* 285. — Brewer & Watson, *Bot. Cal.* i. 168; ii. 443. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 70. — Greene, *Fl. Francis.* 50.

Cerasus ilicifolia, Nuttall; Hooker & Arnott, *Bot. Voy. Beechey*, 340, t. 83. — Torrey & Gray, *Fl. N. Am.* i. 411. — Nuttall, *Sylva*, ii. 16, t. 47. — Torrey, *Emory's Rep.* 139; *Pacific R. R. Rep.* iv. 83. — Walpers, *Ann.* iv. 654. — Kellogg, *Proc. Cal. Acad.* ii. 22. — Bolander, *Proc. Cal. Acad.* iii. 79; iv. 22. — *The Garden*, iii. 131, f.

Laurocerasus ilicifolia, Roemer, *Fam. Nat. Syn.* iii. 92.

A glabrous tree, twenty to thirty feet in height, with a short trunk rarely attaining a diameter of two feet or rising to a greater height than ten or twelve feet, and stout spreading branches forming a dense compact head; usually much smaller, and often a shrub with stems sometimes only a foot or two in length. The bark of the trunk, which varies from one third to one half of an inch in thickness, is dark red-brown, its surface divided by deep fissures into small square plates. The branchlets are at first yellow-green or orange-colored but soon become gray or reddish brown, and are more or less conspicuously marked by minute pale lenticels, and, in their second or third year, by the large leaf-scars left by the falling of the leaves. The buds are acuminate, with narrow dark red scales contracted into long slender points, those of the inner ranks being accrescent and persistent on the young shoots until these have obtained a length of several inches. The leaves are ovate to ovate-lanceolate, acute, rounded or emarginate at the apex, wedge-shaped and rounded or truncate at the base, and very obscurely veined, with thickened margins coarsely spinosely toothed, the stout teeth near the base of the leaf often tipped with large dark glands; they are thick and coriaceous, dark green and lustrous on the upper, and paler and yellow-green on the lower surface, an inch to two and a half inches long, and an inch to an inch and a half broad, with slender yellow midribs grooved on the upper side; they are borne on broad channeled petioles from one eighth to one half of an inch in length, and fall during their second summer. The stipules are acuminate, obscurely denticulate, a quarter of an inch long, and early deciduous. The flowers, which are produced in slender racemes an inch and a half to three inches in length, on short slender pedicels developed from the axils of acuminate scarious bracts a quarter of an inch in length and mostly deciduous before the opening of the flower-buds, are a third of an inch across and appear from March to May. The calyx-tube is cup-shaped and orange-brown, with minute acuminate deciduous lobes reflexed at maturity and about one third as long as the obovate white petals which are rounded above and narrowed below into short claws. The stamens are slightly exserted, with slender incurved filaments which taper from below upwards, and minute yellow anthers. The ovary is glabrous and abruptly contracted into a slender style usually bent near the summit at a right angle, or rarely erect, and surmounted with a large orbicular stigma. The fruit, which ripens in November and December, is subglobose, often compressed, from one half to two thirds of an inch in diameter, dark red when first fully grown, and purple or sometimes nearly black at maturity; the flesh is thin, with a slightly acid astringent and agreeable flavor, and is easily separable from the stone. This is ovate, slightly compressed, pointed at the apex, light yellow-brown, and conspicuously marked with reticulate orange-colored vein-like lines, with three broad orange bands radiating from the base to the apex along one suture, and with a single narrow band along the other suture; the walls are thin and brittle and are composed of two distinct coats, the inner being light yellow and lustrous on the

interior surface. The seed coat is thin and papery, light brown, and conspicuously marked with broad darker colored veins; the cotyledons are orange-brown and inclose the short radicle.

A form, *Prunus ilicifolia*, var. *integrifolia*,[1] common on some of the islands off the coast of California and not rare on the mainland, has entire or occasionally spinose-serrate ovate-acuminate or lanceolate-acuminate, or sometimes broadly ovate and abruptly acute leaves, apiculate at the apex, wedge-shaped, rounded, or truncate at the base, two to three inches long, and from half an inch to two and a half inches broad, and produces rather larger fruit than the more common form with spinosely toothed leaves.

Prunus ilicifolia is distributed from the shores of the Bay of San Francisco southward through the coast ranges to the San Julio cañon in Lower California,[2] and it occurs on the western slopes and foothills of the San Bernardino, and on Santa Cruz and Santa Rosa Islands. It grows as a low shrub on dry hillsides and mesas, or as a tree near streams in the bottoms of cañons in moist sandy soil, reaching its greatest size in those of the Santa Inez Mountains near Santa Barbara, on the islands, and in Lower California.

The wood of *Prunus ilicifolia* is heavy, hard, strong, and close-grained, with a satiny surface susceptible of receiving a beautiful polish. It contains numerous medullary rays and many regularly distributed small open ducts, and is light red-brown, with thin lighter colored sapwood composed of eight or ten layers of annual growth. The specific gravity of the absolutely dry wood is 0.9803, a cubic foot weighing 61.09 pounds.[3] It is sometimes used for fuel, and might be employed in cabinet-making.

Prunus ilicifolia appears to have been first noticed by David Douglas[4] who discovered it on the mountains near Monterey; it was next found by Thomas Nuttall,[5] whose description is the earliest that was published. It was introduced into Europe many years ago, and is now occasionally seen in the gardens of southern Europe,[6] where it flowers and produces fruit abundantly, and in California is sometimes cultivated as an ornamental plant and for hedges.[7]

Few of the broad-leaved evergreens of North America are more beautiful than the Islay,[8] or are better suited to adorn a garden in those parts of the world where the climate permits it to display all the beauties of its abundant lustrous foliage, its showy racemes of flowers, and its handsome fruit. Its rapid growth when planted in good soil,[9] the vigor which enables it to withstand the effects of annual cutting, and its spinescent rigid foliage, make it a useful and interesting hedge plant.[10]

[1] *Prunus ilicifolia*, var. *integrifolia*, Sudworth, *Garden and Forest*, iv. 51.

Prunus occidentalis, W. S. Lyon, *Bot. Gazette*, xi. 202, 333 (not Swartz). — Greene, *Bull. Cal. Acad.* ii. 395.

Prunus ilicifolia, var. *occidentalis*, T. S. Brandegee, *Proc. Cal. Acad.* ser. 2, i. 209. — Sargent, *Garden and Forest*, ii. 400.

[2] Mr. T. S. Brandegee found the entire-leaved form of *Prunus ilicifolia* growing in the San Julio cañon at the southern limit of its known range in a tree-like form with trunks more than a foot in diameter (*l. c.* ii. 121 [*Pl. Baja Cal.*]).

[3] The absolutely dry wood of a log of the entire-leaved form in the Jesup Collection of North American Woods in the American Museum of Natural History in New York, collected by Mr. T. S. Brandegee on Santa Cruz Island, has a specific gravity of 0.7997, a cubic foot weighing 49.84 pounds (*Garden and Forest*, iii. 344).

[4] See ii. 94.

[5] See ii. 34.

[6] I find no record of the date of introduction of *Prunus ilicifolia* into Europe, or of the name of the first person who cultivated it there. In 1850 it was seen by Herincq in the nurseries of Thibaut & Ketelêer near Paris (*Rev. Hort.* 1850, 246), and five years later it was included in the list of plants which perished in the garden of the Muséum d'Histoire Naturelle in Paris during the severe winter of 1854–55 (*Rev. Hort.* 1855, 313). It had been introduced into England before 1853 by the Royal Horticultural Society (Paxton, *Brit. Fl. Gard.* iii. 44, f. 254).

[7] The early Spanish settlers in California appreciated the beauty of *Prunus ilicifolia*, and frequently used it to decorate their gardens; and in those of some of the old missions, fine specimens, probably a hundred years old, testify to its value as an ornamental plant.

[8] *Prunus ilicifolia* is also known in California as the Spanish Wild Cherry and the Mountain Evergreen Cherry.

[9] Plants in the nurseries of the Leland Stanford, Jr. University in Santa Clara County, California, which are only three years old, are eighteen feet high with heads fifteen feet in diameter.

[10] Nicholson, *Dict. Gard.* f. 403, A. (as *Cerasus*). — Naudin, *Manuel de l'Acclimateur*, 445 (as *Pygeum*).

EXPLANATION OF THE PLATES.

Plate CLXII. Prunus ilicifolia.

1. A flowering branch, natural size.
2. Vertical section of a flower just expanded, enlarged.
3. A fruiting branch, natural size.
4. Vertical section of a fruit, natural size.
5. A stone, natural size.
6. An embryo, natural size.

Plate CLXIII. Prunus ilicifolia, *var.* integrifolia.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. Vertical section of a fruit, natural size.

5 and 6. Leaves, showing variation.

C.E. Faxon del.

Picart fr. sc.

PRUNUS ILICIFOLIA, Walp.

A Riocreux direx.t

Imp. R. Taneur, Paris.

C.E Faxon del

Picart fr sc

PRUNUS ILICIFOLIA, Var. INTEGRIFOLIA, Sudworth.

A. Riocreux direx.t

Imp. R. Tancur, Paris.

VAUQUELINIA.

FLOWERS regular, perfect; calyx 5-lobed, the lobes valvate in æstivation; petals 5, imbricated in æstivation; stamens 15 to 25; carpels 5, united into a 5-celled ovary; ovules 2 in each cell, ascending. Fruit a dry 5-celled woody capsule. Leaves simple.

Vauquelinia, Correa; Humboldt & Bonpland, *Pl. Æquin.* i. 140. — Meisner, *Gen.* 103. — Endlicher, *Gen.* 1249. — Bentham & Hooker, *Gen.* i. 615. — Baillon, *Hist. Pl.* i. 472.

Small trees or shrubs, with slender terete branches and scaly bark. Leaves alternate or rarely opposite, lanceolate, serrate, long-petiolate, reticulate-veined, coriaceous, persistent; stipules minute, deciduous. Flowers white, in compound terminal corymbs, the lower branches of the inflorescence from the axils of leaves, the upper from those of minute deciduous bracts. Pedicels slender, bibracteolate. Calyx shortly turbinate, coriaceous, persistent, five-lobed, the lobes ovate, obtuse or acute, erect. Disk connate to and lining the tube of the calyx, glandular. Petals five, inserted in the mouth of the calyx, orbicular or oblong, reflexed at maturity, persistent. Stamens fifteen to twenty-five, inserted on the margin of the disk in three or four proximate rows, equal or subequal, those of the outer row parapetalous, those of the next alternate with them and with those of the other rows; filaments subulate, those of the outer row rather thicker at the base than the others, exserted, persistent; anthers attached on the back near the middle, versatile, extrorse, two-celled, the cells opening longitudinally. Carpels five, opposite the sepals, inserted on the thickened base of the calyx-tube, united below into a five-celled ovoid ovary coated with tomentum and crowned by five short spreading styles with dilated capitate stigmas; ovules two in each cell, subbasilar, ascending, collateral, anatropous, two-coated, prolonged at the apex into thin membranaceous wings; raphe ventral, micropyle superior. Fruit a woody ovoid five-celled tomentose capsule inclosed at the base by the remnants of the flower and separating at maturity into five nutlets adherent below, tipped with the remnants of the styles, and at maturity splitting longitudinally down the back. Seeds two in each cell, ascending, compressed, exalbuminous; testa membranaceous, expanded at the apex into a long membranaceous wing. Embryo filling the cavity of the seed; cotyledons flat; radicle straight, erect.

Vauquelinia is confined to the New World, where it inhabits southern Mexico, northern Mexico, Arizona, and Lower California. Three species are distinguished. The type of the genus, *Vauquelinia corymbosa*,[1] is a small tree widely distributed from the mountains of Oaxaca to those of Coahuila and Chihuahua; *Vauquelinia Karwinskyi*,[2] described as a shrub, inhabits southern Mexico, and *Vauquelinia Californica* the mountain ranges of southern Arizona and the adjacent portions of Sonora and Lower California. The genus is not known to possess properties useful to man.

The generic name commemorates the scientific labors of the distinguished French chemist, Louis Nicolas Vauquelin.[3]

[1] Correa; Humboldt & Bonpland, *Pl. Æquin.* i. 140, t. 40. — Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 238. — Kunth, *Syn. Pl. Æquin.* iii. 479. — Baillon, *Hist. Pl.* i. 398, f. 452–455. — Maximowicz, *Act. Hort. Petrop.* vi. 236 (*Adnot. Spiræaceis*, 132). — Hemsley, *Bot. Biol. Am. Cent.* i. 370. — Pringle, *Garden and Forest*, i. 524.

[2] Maximowicz, *l. c.*

[3] Louis Nicolas Vauquelin (1763–1829); a native of Saint-André-des-Berteaux, after a youth of much privation, became the pupil and later the associate of Fourcroy, with whom he published the results of many of his early investigations and through whom he obtained the position of inspector of mines, and professorships in l'École des Mines, in l'École Polytechnique, and in the Collége de France. He became a member of the Institut de France, director of l'École de Pharmacie, professor of chemistry in the Muséum d'Histoire Naturelle, and a member of the Conseil des Arts et Manufactures. In addition to many papers printed in the Proceedings of learned societies, Vauquelin, who was regarded as one of the most distinguished experimenters in physics and chemistry of his time, published *Le Manuel d'Essayeur* and edited the *Dictionnaire de Chimie et de Métallurgie* which formed part of the *Encyclopédie Méthodique*.

VAUQUELINIA CALIFORNICA.

Leaves narrowly lanceolate, coated on the lower surface with white tomentum.

Vauquelinia Californica, Sargent, *Garden and Forest*, ii. 400.
Spiræa Californica, Torrey, *Emory's Rep.* 140.
Vauquelinia corymbosa, Torrey, *Bot. Mex. Bound. Surv.* 64 (not Correa).
Vauquelinia Torreyi, Watson, *Proc. Am. Acad.* xi. 147. — Brewer & Watson, *Bot. Cal.* i. 169. — Maximowicz, *Act. Hort. Petrop.* vi. 237 (*Adnot. Spiræaceis*, 133). — Hemsley, *Bot. Biol. Am. Cent.* i. 370. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 70.

A small tree, eighteen or twenty feet in height, with a slender often hollow trunk five or six inches in diameter, and rigid upright contorted branches; or more often a low shrub. The bark of the trunk is a sixteenth of an inch thick, with a dark red-brown surface broken into small thin square plate-like persistent scales. The branches are at first bright reddish brown and more or less thickly covered with pale tomentum; and in their second year are light brown or gray and marked with large elevated leaf-scars. The leaves are narrowly lanceolate, acuminate or rarely rounded at the apex, obliquely wedge-shaped or slightly rounded at the base, and remotely serrate with minute glandular teeth; when they unfold they are puberulous on the upper, and densely tomentose on the lower surface, and at maturity are coriaceous, bright yellow-green and glabrous on the upper, and tomentose, or late in the season puberulous, below; they are from an inch and a half to three inches long, and from one quarter to one half of an inch broad, with thick conspicuous midribs grooved on the upper side, and numerous thin primary veins connected by reticulate veinlets, and are borne on thick channeled petioles from one third to one half of an inch in length, and fall in spring or early summer. The stipules are minute, acute, and early deciduous. The flowers, which appear in June, are a quarter of an inch in diameter and are produced in great numbers in loose wide-branched panicles two or three inches across and coated with white tomentum; they vary from those of the type of the genus only in their slightly oblong petals and the pilose inner surface of the disk. The fruit, which is fully grown by the end of August, is then conspicuous on account of the contrast between the bright red faded petals and the white silky covering of the calyx and carpels; it is a quarter of an inch long, and remains on the branches after opening until the spring of the following year. The seed is a twelfth of an inch in length, or one third as long as the oblong wing.

Vauquelinia Californica inhabits the mountain ranges of southern Arizona and those of Sonora and Lower California,[1] but has not been seen with the habit of a tree except on the Santa Catalina Mountains of Arizona; here at an elevation of some five thousand feet above the level of the sea it reaches its largest size in rich granite soil baked by the direct rays of the sun, growing on the bottoms or rocky sides of gulches, or often on grassy slopes and chiefly associated with *Quercus grisea* and *Quercus oblongifolia;* and towards the base of these mountains is common in a shrubby form with *Celtis pallida, Fendlera rupicola, Fouquieria splendens,* and *Rhamnus Purshiana.*

The wood of *Vauquelinia Californica* is very heavy, hard, and close-grained, and is susceptible of receiving a beautiful polish. It contains numerous thin medullary rays, and is dark rich brown streaked with red, with thin yellow sapwood composed of fourteen or fifteen layers of annual growth. The specific gravity of the absolutely dry wood is 1.1374, a cubic foot weighing 70.88 pounds.[2]

Vauquelinia Californica was discovered in October, 1846, by a detachment of United States troops

[1] T. S. Brandegee, *Proc. Cal. Acad.* ser. 2, ii. 154 (*Pl. Baja Cal.*).

[2] The stems of *Vauquelinia Californica* increase very slowly in diameter as shown by the specimen in the Jesup Collection of North American Woods in the American Museum of Natural History in New York, which is only seven inches in diameter, with one hundred and four layers of annual growth.

under command of Colonel William H. Emory,[1] on one of the mountain ranges near the head-waters of the Gila River.

The snowy whiteness of the under surface of its leaves and the abundance of its flowers make *Vauquelinia Californica* an attractive and beautiful plant well worth a place in the gardens of all dry temperate regions.

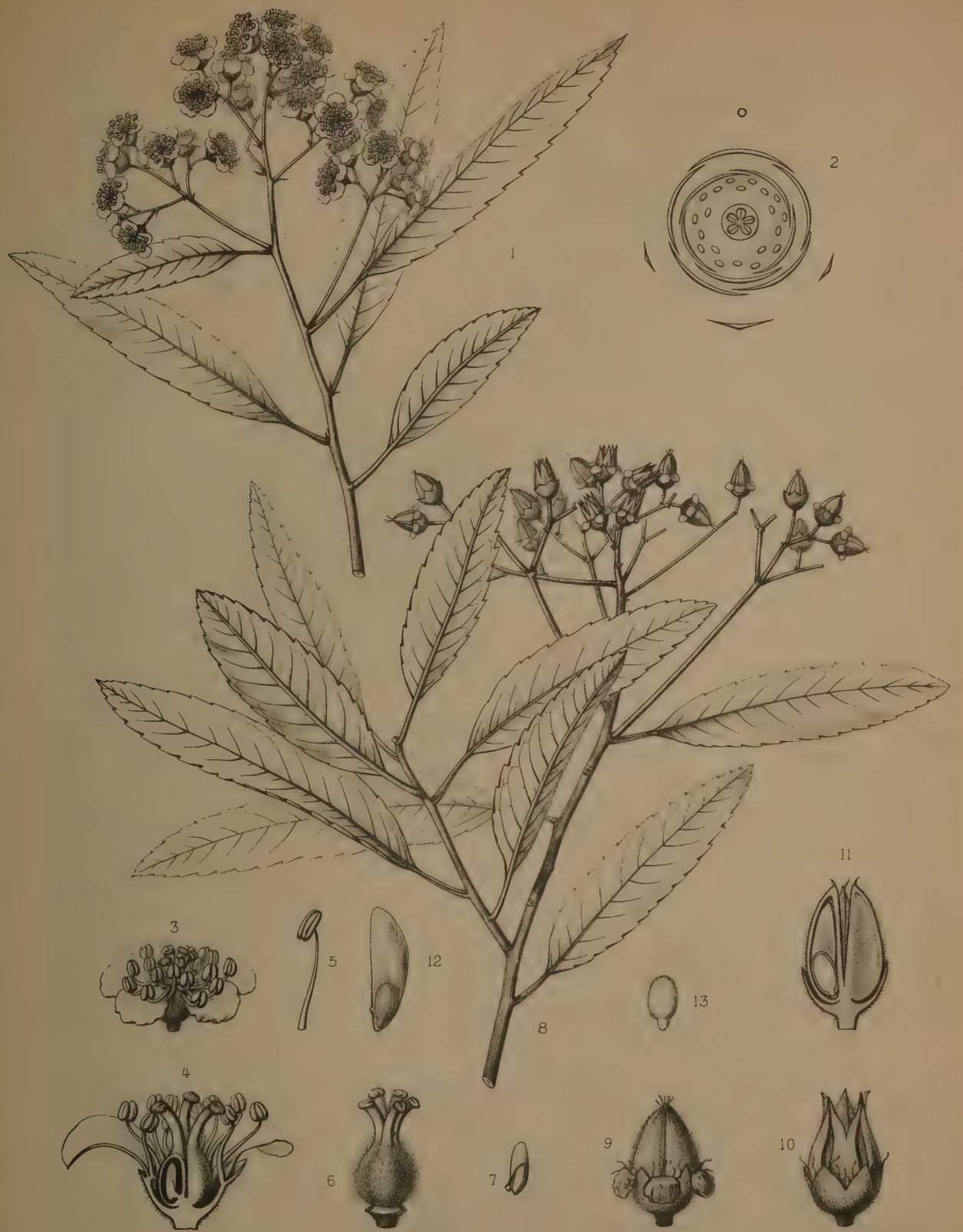
[1] William Hemsley Emory (1811–1887) was born in Queen Anne County, Maryland, and was graduated from the military academy at West Point in 1831, when he was appointed a second lieutenant of artillery. He resigned from the army in 1836 in order to practice civil engineering, but two years later was reappointed with the grade of first lieutenant of topographical engineers. Emory served with distinction in California and in the Mexican War, and on the conclusion of peace was named astronomer to the commission for establishing the boundary between the United States and Mexico, and afterwards became a member of this commission. He fought gallantly in the War of the Rebellion and obtained the rank of major-general of volunteers. He is the author of *Notes of a Military Reconnoissance from Fort Leavenworth in Missouri to San Diego in California*, published in Washington in 1848; of *Notes of Travel in California*, published in New York in 1848, and of the *Report of the United States and Mexican Boundary Commission*, published in Washington in 1857.

Emorya, a shrub of New Mexico and Arizona, dedicated to him by Torrey, commemorates General Emory's active and intelligent interest in increasing the knowledge of plants, and connects his name with the scenes of his scientific labors.

EXPLANATION OF THE PLATE.

PLATE CLXIV. VAUQUELINIA CALIFORNICA.

1. A flowering branch, natural size.
2. Diagram of a flower
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. A stamen, enlarged.
6. A pistil, enlarged.
7. An ovule, much magnified.
8. A fruiting branch, natural size.
9. A fruit, enlarged.
10. A fruit, after the splitting open of the carpels, enlarged.
11. Vertical section of a fruit, enlarged.
12. A seed, enlarged.
13. An embryo, magnified.



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VAUQUELINIA CALIFORNICA, Sarg.

A. Riocreux dirext Imp. R. Taneur, Paris.

CERCOCARPUS.

FLOWERS perfect; calyx 5-lobed, the lobes imbricated in æstivation; petals 0; stamens 15 to 30; carpel 1 or rarely 2. Fruit a linear-oblong akene tipped with the accrescent persistent plumose style. Leaves alternate, simple, persistent.

Cercocarpus, Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 232. — Meisner, *Gen.* 105. — Endlicher, *Gen.* 1245. — Bentham & Hooker, *Gen.* i. 618. — Baillon, *Hist. Pl.* i. 468.

Trees or shrubs, with scaly bark, rigid terete branches, short lateral spur-like branchlets, and hard heavy dark-colored wood. Buds minute, the scales of the inner rows accrescent on the growing shoots, often colored. Leaves alternate, simple, entire or serrate, coriaceous, straight-veined, short-petiolate, persistent; stipules minute, adnate to the base of the petiole, deciduous. Flowers sessile or short-pedicellate, solitary or fascicled, axillary or terminal. Calyx-tube cylindrical, long and pedicelliform, abruptly expanded at the apex into a cup-shaped five-lobed deciduous limb. Disk thin, slightly glandular, adnate to the tube of the calyx. Stamens inserted in two or three rows on the limb of the calyx, those of the outer row parasepalous and alternate with those of the inner rows; filaments incurved in the bud, free, short, terete; anthers oblong, usually pubescent, attached on the back, introrse, two-celled, the cells opening longitudinally, distinct, united by a broad connective. Ovary composed of a single carpel, inserted in the bottom and included in the tube of the calyx, acute, terete, smooth, striate or sulcate, sericeous; or rarely bicarpellate; style terminal, filiform, villose, or glabrate, crowned with a minute obtuse stigma; ovules solitary, subbasilar, ascending, anatropous; raphe dorsal, the micropyle inferior. Akene linear-oblong, coriaceous, slightly ridged, angled, or sulcate, included in the persistent tube of the calyx and surmounted by the long persistent plumose style, which in enlarging and lengthening raises the limb of the calyx now separated near the apex of the tube by a circumscissile line. Seeds solitary, linear-acute, erect, exalbuminous, the conspicuous hilum lateral above the oblique base; testa membranaceous. Embryo filling the cavity of the seed; cotyledons ovate-oblong, elongated, fleshy; radicle inferior.

Cercocarpus is confined to the dry interior and mountainous regions of North America. Three species can be distinguished. The type of the genus, *Cercocarpus fothergilloides*,[1] inhabits the mountains of southern Mexico; the others are small shrubby trees of the central and western parts of the United States and of northern Mexico. The wood of all the species makes valuable fuel, and is occasionally used in the manufacture of many small objects for domestic and industrial use.

The generic name, from κέρκος and καρπός, refers to the peculiar long-tailed fruit.

[1] Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 233, t. 559. — Kunth, *Syn. Pl. Æquin.* iii. 475. — De Candolle, *Prodr.* ii. 589. — Baillon, *Hist. Pl.* i. 381, f. 436, 437. — Hemsley, *Bot. Biol. Am. Cent.* i. 373. — Engler & Prantl, *Pflanzenfam.* iii. 39, f. 17.

CONSPECTUS OF THE NORTH AMERICAN SPECIES.

Leaves narrowly linear, entire . . . . . 1. C. LEDIFOLIUS.
Leaves cuneate-obovate, coarsely glandular-serrate above the middle . . . . . 2. C. PARVIFOLIUS.

CERCOCARPUS LEDIFOLIUS.

Mountain Mahogany.

LEAVES narrowly lanceolate, entire.

Cercocarpus ledifolius, Nuttall; Torrey & Gray, *Fl. N. Am.* i. 427; *Sylva*, ii. 28, t. 51. — Hooker, *Icon.* iv. t. 324. — Walpers, *Rep.* ii. 46. — Dietrich, *Syn.* iii. 119. — Watson, *King's Rep.* v. 83, 420. — Parry, *Am. Nat.* ix. 201, 270; *Proc. Davenport Acad.* i. 146. — Brewer & Watson, *Bot. Cal.* i. 174. — Rothrock, *Wheeler's Rep.* vi. 43, 111, 360. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 71. — Coulter, *Man. Rocky Mt. Bot.* 80. — M. E. Jones, *Zoë*, ii. 244.

A resinous and slightly aromatic tree, rarely attaining a height of forty feet, with a short stout trunk occasionally two and a half feet in diameter, and stout spreading usually contorted branches forming a round compact head; generally much smaller, or often a low intricately branched shrub. The bark of the trunk of old individuals is an inch thick and is divided by deep broad furrows, the red-brown surface being broken into thin persistent plate-like scales. The branchlets are red-brown at first and coated with pale pubescence, but soon become glabrous and sometimes covered with a glaucous bloom, and in their second season are silver gray or dark brown, and for many years are marked by the conspicuous elevated leaf-scars which give a moniliform appearance to the branches of slow-grown stunted individuals. The leaves, which remain on the branches until the end of their second summer, are crowded, narrowly lanceolate, acute at both ends, apiculate, and entire, with thick revolute margins; they are thick and coriaceous, reticulate-veined, with broad thick midribs deeply grooved on the upper side, and obscure primary veins, usually puberulous when young but at maturity glabrous on the upper surface, and more or less coated with pale or rufous pubescence on the lower surface, and are resinous, half an inch to an inch in length, a third to two thirds of an inch in width, and are borne on short broad petioles. The stipules are minute, nearly triangular, and caducous. The flowers are solitary, sessile in the axils of the clustered leaves, two thirds of an inch long, the calyx with acute lobes covered with pale tomentum. The enlarged calyx-tube of the fruit is almost half an inch long, nearly cylindrical but rather larger above than below, ten-ribbed, obscurely ten-angled, slightly cleft at the apex, and coated with pale tomentum. The akene is chestnut-brown, pointed at the two ends, obscurely angled, a quarter of an inch long, and clothed with long pale or tawny hairs similar to those that cover the tail-like lengthened style which at maturity is two or three inches in length, and is generally contracted by one or two partial corkscrew twists.

Cercocarpus ledifolius inhabits the mountain ranges of the interior region of the United States, and is distributed from western Wyoming to the western slopes of the Rocky Mountains of Montana, the Cœur d'Alêne Mountains of Idaho, and the eastern portions of the Blue Mountains of Oregon, and southward through the Wasatch Mountains and the ranges of the Great Basin to the eastern slopes of the Sierra Nevada and the northern slopes of the San Bernardino Mountains and to the mountains of northern New Mexico and Arizona. It inhabits dry gravelly arid slopes at elevations of from five thousand to nine thousand feet above the level of the ocean, growing sometimes on almost precipitous cliffs and on rocky ridges, where it is a densely branched contorted shrub which often forms broad thickets, or, on better soil and with more moisture, rising to a shapely tree and reaching its greatest size on the high foothill-slopes of the mountain ranges of central Nevada between six thousand and eight thousand feet above the level of the sea.[1]

[1] Sargent, *Am. Jour. Sci.* ser. 3, xvii. 420.

The wood of *Cercocarpus ledifolius* is very heavy, hard, and close-grained, although brittle and extremely difficult to work. It contains numerous thin medullary rays, and is bright clear red or often rich dark brown, with thin yellow sapwood composed of fifteen or twenty layers of annual growth, and is susceptible of receiving a beautiful polish. The specific gravity of the absolutely dry wood is 1.0731, a cubic foot weighing 66.88 pounds. It furnishes the most valuable fuel produced in the region that it inhabits, and in the Great Basin is largely manufactured into charcoal used in smelting silver ore.

A variety of this plant, *Cercocarpus ledifolius*, var. *intricatus*,[1] a low intricately branched shrub, distinguished by its linear revolute leaves and small flowers and fruit, is common on the mountain ranges of Utah and Arizona, where, at high elevations, it sometimes covers cliffs and rocky mountain slopes, and at lower elevations gradually and by many intermediate forms passes into the large-leaved upright arborescent form.[2]

Cercocarpus ledifolius was discovered in 1834 by Thomas Nuttall[3] in the valley of the upper Snake River in western Wyoming.

Few other trees produce more valuable fuel than *Cercocarpus ledifolius;* this fact, and its ability to thrive under the most severe climatic conditions and to clothe and protect exposed mountain slopes where few other trees could maintain themselves and where no other hard-wood tree is found, make it one of the most valuable trees of the North American forests[4] in spite of its small size and its slow rate of growth.[5]

[1] M. E. Jones, *Zoë*, ii. 244.

Cercocarpus intricatus, Watson, *Proc. Am. Acad.* x. 346. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 71.

Cercocarpus brevifolius, Watson, *King's Rep.* v. 83 (not Gray).

Cercocarpus Arizonicus, M. E. Jones, *Zoë*, ii. 14.

[2] Parry, *Proc. Davenport Acad.* i. 147.

[3] See ii. 34.

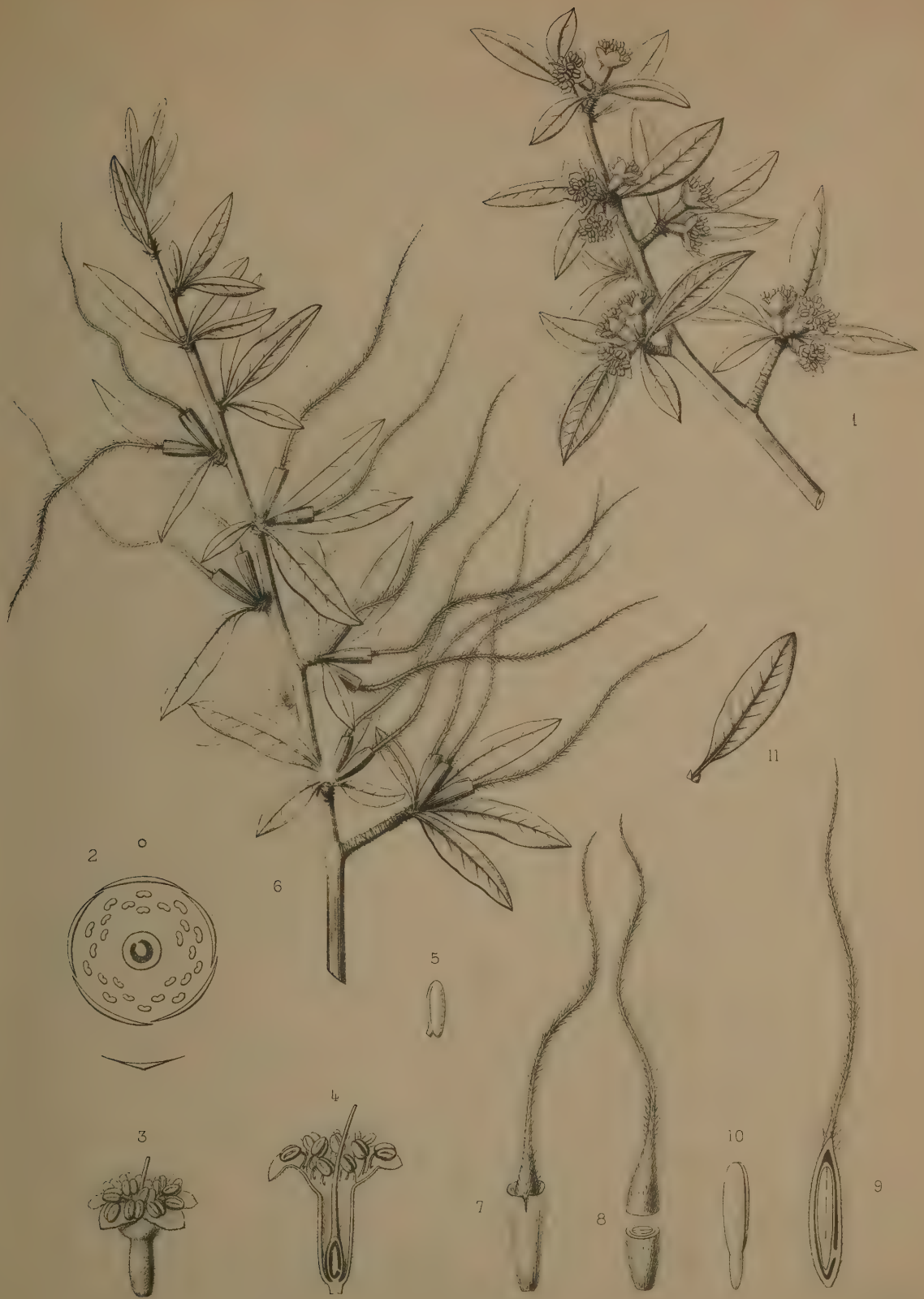
[4] Seeds of *Cercocarpus ledifolius* were sent to the principal botanical establishments of Europe from the Arnold Arboretum in 1878. It is still, however, exceedingly rare in cultivation, although it may be expected to flourish on the dry high mountain slopes of southern Europe and northern Africa, and in some parts of India.

[5] A specimen in the Jesup Collection of North American Woods in the American Museum of Natural History in New York displays one hundred and eight layers of annual growth, and inside the bark is only thirteen inches in diameter.

EXPLANATION OF THE PLATE.

PLATE CLXV. CERCOCARPUS LEDIFOLIUS.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. An ovule, much magnified.
6. A fruiting branch, natural size.
7. A fruit inclosed in the tube of the calyx, enlarged.
8. An akene divided transversely, enlarged.
9. Vertical section of a fruit, enlarged.
10. An embryo, much magnified.
11. A leaf with stipules, enlarged.



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CERCOCARPUS LEDIFOLIUS, Nutt.

A Riocreux direx.t

Imp R. Taneux. Paris

CERCOCARPUS PARVIFOLIUS.

Mountain Mahogany.

LEAVES cuneate-obovate, coarsely glandular-serrate above the middle.

Cercocarpus parvifolius, Nuttall; Hooker & Arnott, *Bot. Voy. Beechey*, 337. — Torrey & Gray, *Fl. N. Am.* i. 427; *Pacific R. R. Rep.* ii. 164. — Hooker, *Icon.* iv. t. 323. — Walpers, *Rep.* ii. 45. — Torrey, *Frémont's Rep.* 89; *Emory's Rep.* 139; *Sitgreaves' Rep.* 158; *Pacific R. R. Rep.* iv. 83; *Bot. Mex. Bound. Surv.* 63; *Bot. Wilkes Explor. Exped.* 287. — Dietrich, *Syn.* iii. 119. — Gray, *Smithsonian Contrib.* iii. 68; v. 54 (*Pl. Wright.* i., ii.). — Watson, *King's Rep.* v. 82. — Rothrock, *Wheeler's Rep.* vi. 111, 359. — Brewer & Watson, *Bot. Cal.* i. 174; ii. 444. — M. E. Jones, *Excur. Bot.* 12, 15, 20, 21; *Zoë*, ii. 245. — Hemsley, *Bot. Biol. Am. Cent.* i. 374. — Watson, *Proc. Am. Acad.* xvii. 353. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 71. — Coulter, *Man. Rocky Mt. Bot.* 81. — Greene, *Fl. Francis.* i. 59.

Cercocarpus fothergilloides, Torrey, *Ann. Lyc. N. Y.* ii. 198 (not Humboldt, Bonpland & Kunth).

A bushy tree, with aromatic leaves and branches, sometimes twenty to thirty feet in height, with a trunk which rarely attains a greater diameter than ten inches, and slender rigid upright branches; or more often a small or tall shrub branching from a thickened base. The bark of the trunk is a sixteenth of an inch thick, the generally smooth surface being divided by narrow shallow fissures and broken into small square persistent red-brown scales. The branchlets are clothed at first with pale silky pubescence; this soon disappears, and during their first year they are rather bright red-brown and are marked by occasional oblong light-colored lenticels, and in their second year are dark gray or brown and covered with the conspicuous ring-like leaf-scars. The leaves, which do not fall until the summer of their second year, are cuneate-obovate, rounded or obtuse or rarely acuminate and gradually contracted at the base, coarsely glandular-serrate above the middle, or rarely almost entire, or slightly three-toothed or apiculate at the apex; when they unfold they are coated with pale pubescence on both surfaces, and at maturity are puberulous or glabrous above and more or less pubescent below, and are subcoriaceous, dark yellow-green on the upper, and paler or often nearly white or sometimes ferrugineous on the lower surface, half an inch to two and a half inches in length and a quarter of an inch to an inch in breadth, with slightly thickened and revolute margins, broad midribs, four to six pairs of conspicuous primary veins, and reticulate veinlets; and they are borne on broad channeled petioles which vary from an eighth to nearly half an inch in length. The stipules are lanceolate, acuminate, apiculate, from an eighth to a quarter of an inch in length, and early deciduous. The flowers, which are produced on slender hairy pedicels, are solitary or geminate in the axils of the crowded leaves, and are a quarter of an inch long, with a slender tube covered on the outer surface with pale tomentum and a narrow obtusely lobed limb. The mature calyx-tube of the fruit is spindle-shaped, light chestnut-brown, slightly puberulous, deeply cleft at the apex, and from one half to three quarters of an inch long. The akene is more or less conspicuously sulcate on the back and is covered, like the persistent tail-like style which is often four or five inches in length, with long white hairs.

Cercocarpus parvifolius is widely and generally distributed on the mountain ranges of the arid portions of western North America from western Nebraska[1] to the northern slopes of the Siskiyou Mountains in Oregon[2] on the north, and to western Texas[3] and northern Mexico on the south; in California, west of the Sierra Nevada Mountains, it is common through the coast ranges, extending south to the San Jacinto Mountains; it occurs on Santa Cruz Island[4] and on some of the mountain ranges of Lower California.

[1] Bessey, *Bull. Agric. Exper. Stat. Nebraska*, iv. art. iv. 19.

[2] Greene, *Garden and Forest*, ii. 470.

[3] Coulter, *Contrib. U. S. Nat. Herb.* ii. 104 (*Man. Pl. W. Texas*).

[4] Greene, *Bull. Cal. Acad.* ii. 396 (as *C. betulæfolius*).

The wood of *Cercocarpus parvifolius* is heavy, hard, and close-grained and difficult to season and work; it contains numerous thin medullary rays, and is bright red-brown, with thin light brown sapwood composed of twenty layers of annual growth. The specific gravity of the absolutely dry wood is 0.9365, a cubic foot weighing 58.36 pounds. It makes excellent fuel, and is sometimes used by turners for boxes and other small objects. The shoots and leaves, which possess a birch-like flavor, are relished by cattle, which browse upon them in late summer and autumn after the annual grasses have disappeared.[1]

Cercocarpus parvifolius varies in the size and shape of its leaves and in the amount of their pubescence in different parts of the territory it inhabits; in the California coast ranges it frequently produces larger fruit than is developed in the dry interior parts of the country, and larger and proportionately broader leaves which are often quite glabrous,[2] while near the southern boundary of the United States the leaves are sometimes much reduced in size[3] and are entire or sparingly toothed.[4]

Cercocarpus parvifolius was discovered in the Rocky Mountains on the head-waters of the Platte River in 1820 by Dr. Edwin P. James,[5] the naturalist of Long's expedition. In California it was first noticed a few years later by David Douglas.[6] *Cercocarpus parvifolius* is sometimes seen in the botanic gardens of Europe, where it occasionally flowers and produces its fruit.

[1] Greene, *Garden and Forest*, ii. 470.

[2] *Cercocarpus parvifolius*, var. *betuloides*.

Cercocarpus betuloides, Nuttall; Torrey & Gray, *Fl. N. Am.* i. 427. — Hooker, *Lond. Jour. Bot.* vi. 218.

Cercocarpus betulæfolius, Nuttall; Hooker, *Icon.* iv. t. 322. — Walpers, *Rep.* ii. 46. — Greene, *Bull. Cal. Acad.* ii. 396; *Garden and Forest, l. c.; Fl. Francis.* i. 59.

Cercocarpus parvifolius, var. *glaber*, Brewer & Watson, *Bot. Cal.* i. 175. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 71.

Professor E. L. Greene, whose opportunities for studying the trees of western America in their native forests have been great, believes (*Garden and Forest, l. c.*) that the California coast plant is specifically distinct from the plant of the dry interior part of the country on account of "a certain constant difference in the general bearing or habit easily seen at a glance but not easily defined," and of the character of the bark, which on the coast plant is smooth and gray, "the outer layer deciduous and falling away in irregular flakes in the early autumn," while on the Rocky Mountain plant it is "dark-colored, thick, persistent, and fissured;" but these differences, like the more arborescent habit, the better developed leaves, and the absence of pubescence, are perhaps due to the more favorable climatic conditions amid which the coast plants have grown.

[3] *Cercocarpus parvifolius*, var. *brevifolius*, M. E. Jones, *Zoë*, ii. 245.

Cercocarpus brevifolius, Gray, *Smithsonian Contrib.* v. 54 (*Pl. Wright.* ii.). — Walpers, *Ann.* iv. 665.

[4] *Cercocarpus parvifolius*, var. *paucidentatus*, Watson, *Proc. Am. Acad.* xvii. 353. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 71. This form, which is not uncommon in northern Mexico and in the mountains of southern Arizona, is connected by many intermediate forms with that of the Colorado mountains, which has large and coarsely serrate leaves, just as the last-named passes imperceptibly into the still larger-leaved plant of the California coast.

[5] See ii. 96.

[6] See ii. 94.

EXPLANATION OF THE PLATE.

PLATE CLXVI. CERCOCARPUS PARVIFOLIUS.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. Front and rear views of a stamen, enlarged.
5. A pistil, enlarged.
6. A fruiting branch, natural size.
7. A fruit, inclosed in the tube of the calyx, enlarged.
8. An akene, enlarged.
9. Vertical section of an akene, enlarged.
10. A seed, enlarged.
11. An embryo, much magnified.

C. E. Faxon del. Picart fr. sc.

CERCOCARPUS PARVIFOLIUS, Nutt.

A. Riocreux direx.t Imp. R. Taneur, Paris.

PYRUS.

FLOWERS perfect or rarely polygamo-dicœcious by abortion, regular; calyx 5-lobed, the lobes imbricated in æstivation; petals 5, imbricated in æstivation; stamens usually 20, or indefinite; ovary 2 to 5-celled; ovules 2 in each cell, ascending. Fruit a pome. Leaves alternate, simple or pinnate, deciduous.

Pyrus, Linnæus, *Gen.* 145 (excl. *Cydonia*). — Adanson, *Fam. Pl.* ii. 296 (excl. *Cydonia*). — A. L. de Jussieu, *Gen.* 335. — Meisner, *Gen.* 106. — Endlicher, *Gen.* 1237. — Bentham & Hooker, *Gen.* i. 626 (excl. *Cydonia* and *Mespilus*). — Baillon, *Hist. Pl.* i. 403.

Sorbus, Linnæus, *Gen.* 144. — Adanson, *Fam. Pl.* ii. 296. — A. L. de Jussieu, *Gen.* 335.

Malus, Ruppius, *Fl. Jen.* ed. 3, 141. — Medicus, *Phil. Bot.* i. 138.

Torminalis, Medicus, *Phil. Bot.* i. 134.

Lazarolus, Medicus, *Phil. Bot.* i. 135.

Aucuparia, Medicus, *Phil. Bot.* i. 138.

Chamæmespilus, Medicus, *Phil. Bot.* i. 138.

Pirophorum, Necker, *Elem. Bot.* ii. 72.

Apirophorum, Necker, *Elem. Bot.* ii. 72.

Hahnia, Medicus, *Gesch. Bot.* 81.

Azarolus, Borkhausen, *Handb. Forstbot.* ii. 1224.

Aronia, Persoon, *Syn.* ii. 39 (excl. *Amelanchier*).

Aria, Host, *Fl. Austr.* ii. 7.

Cormus, Spach, *Hist. Vég.* ii. 96.

Torminaria, Roemer, *Fam. Nat. Syn.* iii. 101.

Micromeles, Decaisne, *Nouv. Arch. Mus.* x. 168.

Chloromeles, Decaisne, *Fl. des Serres*, xxiii. 156.

Trees or shrubs, with smooth or scaly bark, terete branches, imbricated bud-scales, and fibrous roots. Leaves involute or conduplicate in vernation, simple, palmately lobed or unequally pinnate, usually serrate, deciduous; stipules entire or lobed, free from the petiole, deciduous. Flowers in simple or compound terminal cymes, rarely corymbose or racemose or one or two-flowered, from buds formed the previous year. Bracts and bractlets subulate or foliaceous, deciduous. Calyx-tube urceolate or rarely turbinate, adnate to the ovary and fleshy at maturity, the five-lobed limb with acuminate reflexed lobes persistent, or deciduous with the apex of the receptacle. Disk lining the tube of the calyx, more or less thickened over the ovary. Petals white, pink, or red, suborbicular, unguiculate, inserted on the slightly thickened border of the disk. Stamens usually twenty, inserted in three rows, those of the outer row of ten parapetalous, those of the other rows alternate with them and with each other; filaments subulate, free or slightly connate at the base; anthers oblong, pale, red, or purple, attached on the back, two-celled, the cells opening longitudinally. Carpels five, alternate with the petals, or two to four, inserted in the bottom of the calyx-tube and united into an inferior ovary; styles terminal, free, or united below; stigmas capitate, truncate; ovules two in each cell, ascending, collateral, anatropous, the raphe dorsal, the micropyle inferior. Fruit an ovoid globose or pyriform pome formed by the thickening of the walls of the calyx-tube and its consolidation with the ovary; mesocarp more or less fleshy, the flesh homogeneous or granular, adherent to the one to five-celled endocarp, the cells crustaceous or cartilaginous, usually two-valved. Seeds two or by abortion one in each cell, ovate, acute, erect, exalbuminous; testa usually cartilaginous, chestnut-brown and lustrous, slightly mucilaginous on the outer surface. Embryo erect; cotyledons plano-convex, fleshy; radicle short, inferior.[1]

[1] The genus Pyrus may be divided into the following sections which some authors consider entitled to the rank of genera: —

MALUS. Flowers fascicled or subumbellate on short spur-like lateral branchlets; ovary 3 to 5-celled; styles more or less united below. Fruit globose, umbilicate or rounded at the base; the flesh homogeneous. Leaves entire, or laciniate on vigorous shoots.

PYRUS. Flowers in few-flowered corymbs on short spur-like lateral branchlets; ovary 5-celled; styles free. Fruit pyriform or subglobose, tapering at the base, the flesh granular. Leaves simple.

ARIA. Flowers in corymbose cymes; ovary 2 to 5-celled; styles free. Fruit pyriform or globose; flesh granular. Leaves entire or lobed.

ARONIA. Flowers in compound corymbs; ovary 4 or 5-celled; styles united at the base. Fruit berry-like, pyriform or subglobose. Leaves simple, their midribs glandular on the upper side.

The genus Pyrus is widely and generally distributed through the temperate parts of the northern hemisphere; from thirty to forty species may be distinguished, the largest number inhabiting south-central and eastern Asia. In North America the genus is represented by seven species, of which five are small trees and two are shrubs of the eastern states;[1] in Europe, where the genus is distributed from Great Britain and Scandinavia to Spain, southern Italy, and Greece, eight or nine species with many natural varieties are recognized.[2] Pyrus is spread through the mountain regions of the Orient,[3] and abounds in the Himalayas with twenty-two species,[4] and in China and Japan,[5] where botanists recognize fourteen or fifteen species.[6]

Pyrus is chiefly valuable to man for the fruits of *Pyrus Malus*,[7] the Apple, and of *Pyrus communis*,[8] the Pear, which supply him with important articles of food, and with alcoholic liquors.[9]

Micromeles. Flowers in cymose corymbs; calyx-lobes deciduous; ovary 2 to 3-celled; styles free or united. Fruit small, globose, umbilicate. Leaves simple.

Sorbus. Flowers in ample compound cymes; ovary 2 to 4, usually 3-celled; styles 3. Fruit subglobose, berry-like, crowned with the thickened and often incurved persistent calyx-lobes. Leaves unequally pinnate, the leaflets conduplicate in vernation.

[1] These both belong to the section Aronia and are distributed through all the country east of the mid-continental plateau from Nova Scotia to Florida and Louisiana. They are: —

Pyrus arbutifolia, Linnæus f. *Syst.* ed. 13, Suppl. 256. — *Bot. Mag.* t. 3668. — Torrey & Gray, *Fl. N. Am.* i. 471. — Chapman, *Fl.* 128. — Watson & Coulter, *Gray's Man.* ed. 6, 164. — Sargent, *Garden and Forest*, iii. 416, f. 52.

Mespilus arbutifolia, Linnæus, *Spec.* 478.

Pyrus nigra, Sargent, *Garden and Forest*, iii. 416.

Pyrus arbutifolia, var. *nigra*, Willdenow, *Spec.* ii. pt. ii. 1013.

Mespilus arbutifolia, var. *melanocarpa*, Michaux, *Fl. Bor.-Am.* i. 292.

Pyrus arbutifolia, var. *melanocarpa*, Hooker, *Fl. Bor.-Am.* i. 204. — Torrey & Gray, *l. c.* — Chapman, *l. c.* 129. — Watson & Coulter, *l. c.*

[2] Nyman, *Conspect. Fl. Europ.* 240.

[3] Boissier, *Fl. Orient.* ii. 653.

[4] Hooker f. *Fl. Brit. Ind.* ii. 372.

[5] Franchet & Savatier, *Enum. Pl. Jap.* i. 138. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xix. 169 (*Mél. Biol.* ix. 164). — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 254.

[6] Of the different sections of the genus, Malus is eastern and western North American, European, and Asiatic, one species being now, through cultivation, widely naturalized beyond its original home. Pyrus is southern European, western Asiatic, and eastern Asiatic.

Aria is northern European, western Asiatic, Himalayan, and eastern Asiatic. Aronia is eastern North American. Micromeles is Himalayan. Sorbus, the most widely distributed of the sections into which the genus is divided, is spread over the boreal and elevated portions of the three continents.

[7] Linnæus, *Spec.* 479. — De Candolle, *Prodr.* ii. 635. — Maximowicz, *l. c.* 165. — Brandis, *Forest Fl. Brit. Ind.* 205. — Hooker f. *l. c.*

Malus communis, Desfontaines, *Hist. Arb.* ii. 140. — Boissier, *l. c.* 656. — Decaisne, *Nouv. Arch. Mus.* x. 135.

The native country of *Pyrus Malus* is uncertain; it is believed to be indigenous in the northwestern Himalayas, where it ascends to an elevation of nine thousand feet above the level of the ocean and of eleven thousand four hundred feet in western Thibet (Hooker f. *l. c.*), and in Anatolia, where, on the mountains of Trebizond along the southern shores of the Black Sea, it forms forests of considerable extent (Boissier, *l. c.*). In southern and central Europe it has existed either in a wild or cultivated state since prehistoric times (A. de Candolle, *Origine des Plantes Cultivées*, 186); and in some parts of the eastern United States it already grows spontaneously (Britton, *Cat. Pl. N. J.* 99).

Pyrus Malus has been cultivated in Europe since the days of the ancients, and from time immemorial in India, Cashmere, and northern China. It is the most valuable fruit-tree of the temperate zones, and thousands of varieties have been obtained from it by selection and cultivation, or by crossing its cultivated varieties with *Pyrus prunifolia* (Willdenow, *Spec.* ii. pt. ii. 1018. — De Candolle, *Prodr.* ii. 635) or perhaps with varieties of *Pyrus baccata*. It is from these crosses that the best varieties of the cultivated Crab-apples have been obtained.

[8] Linnæus, *l. c.* 479. — De Candolle, *l. c.* 633. — Boissier, *l. c.* 653. — Brandis, *l. c.* 203. — Hooker f. *l. c.* 374.

Pyrus communis grows naturally in nearly all the elevated regions of Europe and in western Asia, especially in Anatolia, the southern Caucasian provinces, and northern Persia; it grows spontaneously in northern and northeastern Europe and perhaps naturally in Cashmere and the northwestern Himalayas (A. de Candolle, *l. c.* 183).

The Pear-tree, which has been cultivated in Europe from ancient times, has given rise to innumerable varieties, many of which were known to the Romans in the time of Pliny, and the lists of pomologists now contain the names of hundreds of cultivated Pears (Decaisne, *Le Jardin Fruitier*, i. *Poirier*, 72. — Downing, *The Fruits and Fruit-Trees of America*, ed. 2, 639) which have been derived from *Pyrus communis*, and from *Pyrus nivalis* (Jacquin, *Fl. Austr.* ii. 4, t. 107. — Decaisne, *l. c.* 326, t. 21), from which is derived the race of Pears with hard acid fruit cultivated for cider (A. de Candolle, *l. c.* 185), or from the intercrossing of the different species of the section Pyrus, which are sometimes believed to represent geographical races of one widely distributed polymorphous species (Decaisne, *l. c.* 132).

[9] Cider, which contains from four to ten per cent. of alcohol, is made from the juice of the ripe fruit of the Apple, which is pressed from the pulp and allowed to ferment in open casks; at the end of two or three days the liquor is drawn off, put into fresh casks, and allowed to settle in a low regular temperature for thirty or forty days when the process is complete. Cider is of three qualities, rough, sweet, and bitter. The first is made by grinding unripe or carelessly selected fruit, the juice being allowed full fermentation, and the second is made from fully ripe sweet apples, the process of fermentation being checked before completion. Bitter cider owes its peculiarities of flavor to the character of the fruit from which it is made. Ciderkin is made by infusing with boiling water

Pyrus Sinensis,[1] a native of northern China, has long been cultivated on an extensive scale in China[2] and Japan[3] for its large and handsome fruit, and recently has attracted the attention of pomologists in the United States and Europe.[4] The fruit of most of the species, especially of those of the section Sorbus, contains malic and tartaric acids,[5] and the unripe fruit and bark of these plants are astringent and are sometimes employed medicinally.[6]

The wood of Pyrus is hard, heavy, and close-grained, and that of several of the species is esteemed by millwrights, turners, and engravers, and makes excellent fuel. The beauty and abundance of their flowers and fruit, their excellent habit, and their hardiness, make many of the species valuable garden plants, particularly the Asiatic *Pyrus baccata*[7] with its numerous varieties, *Pyrus Toringo*,[8] *Pyrus spectabilis*,[9] *Pyrus salicifolia*,[10] the various North American species, and the species of Sorbus[11] and Aria.[12]

the marc or refuse left after the juice has been extracted from the fruit for cider, the mass being again subjected to pressure. Cider is manufactured principally in the eastern United States, in several English counties, principally Herefordshire, Devonshire, and Somerset, in Normandy and Brittany in France, and in northern Germany. Vinegar is sometimes made from cider which has soured owing to a deficiency of alcohol, by exposure to spontaneous acetification.

Perry, which resembles cider, is made by the same process from varieties of the pear selected on account of their austere juice. It is principally produced in southern England and in western France, where Pear-trees are cultivated on a large scale for this purpose (Loudon, *Arb. Brit.* ii. 884. — Spons, *Encyclopædia of the Industrial Arts, Manufactures, and Raw Commercial Products*, i. 414, 421).

[1] Lindley, *Trans. Hort. Soc. Lond.* vi. 396; *Bot. Reg.* t. 1248. — Decaisne, *Le Jardin Fruitier*, i. *Poirier*, 331, t. 5. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xix. 172 (*Mél. Biol.* ix. 168). — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 257.

Pyrus communis, Thunberg, *Fl. Jap.* 207 (not Linnæus).

Pyrus Ussuriensis, Maximowicz, *Prim. Fl. Amur.* 102.

[2] Loureiro, *Fl. Cochin.* 321. — Bretschneider, *Early European Researches into the Flora of China*, 150.

[3] With the exception of the Persimmon the Pear is the most common fruit-tree of Japan, where it was early introduced from northern China. Several varieties have been developed in Japanese gardens, but they differ less from each other than the pears of European origin, although some ripen in the summer and others in the autumn. In the neighborhood of large cities there are Pear-orchards in which the trees are carefully cultivated and manured; the tops are trained over Bamboo frames, and too vigorous shoots are removed to insure the production of large crops of fruit. The trees are propagated by grafting selected varieties on seedling stocks, and often by cuttings which are made in March from stout yearling shoots; these are pointed, their ends are charred, and they are then set in rows in deep rich soil, and at the end of a few years are transplanted into the orchards (Rein, *Japan nach Reisen und Studien im Auftrage der Königlich Preussischen Regierung*, ii. 99).

[4] Downing, *The Fruits and Fruit-Trees of America*, ed. 2, 851. — *Gard. Chron.* n. ser. iv. 456, f. 95; ser. 3, ix. 141, f. 36. — *Rev. Hort.* 1878, 310, t.; 1885, 286, f. 49.

[5] Baillon, *Traité Bot. Med.* 559.

[6] Linnæus, *Mat. Med.* 81. — Stillé & Maisch, *Nat. Dispens.* 1334.

[7] Linnæus, *Mant.* 75. — De Candolle, *Prodr.* ii. 635. — Maximowicz, *l. c.* 166. — Hooker f. *Fl. Brit. Ind.* ii. 373. — Forbes & Hemsley, *l. c.* 255.

Pyrus baccata, which is widely distributed in Siberia, in the Himalayas, and in northern China and Japan, has been cultivated as a garden ornament by the Chinese and Japanese from very early times, and many forms have been developed in their gardens differing in the habit of the plants, in the size and character of the fruit, and in the color of the flowers, which are sometimes semi-double; among these varieties are some of the most beautiful of all flowering trees, and their free-flowering habit, hardiness, and immunity from disease and the attacks of insects commend them to the attention of gardeners (*Fl. des Serres*, xv. 161, t. 1585, 1586, 1587. — Carrière, *Pommiers Microcarpes*, 68. — *Garden and Forest*, ii. 260, 520, f. 139).

[8] Siebold, *Cat. Rais.* i. 4. — Koch, *Dendr.* i. 212. — Maximowicz, *l. c.* 167.

Pyrus Sieboldii, Regel, *Gartenflora*, viii. 82.

Malus Toringo, Carrière, *Rev. Hort.* 1872, 210, f. 25; *Pommiers Microcarpes*, 61, f. 11.

[9] Aiton, *Hort. Kew.* ii. 175. — *Nouveau Duhamel*, vi. 141, t. 42, f. 2. — Watson, *Dendr. Brit.* i. 50, t. 50. — Koch, *l. c.* 209. — Maximowicz, *l. c.* 166. — Forbes & Hemsley, *l. c.* 258.

This tree, which is believed to be a native of northern China and is known in cultivation only in a form with semidouble flowers, is one of the handsomest of the small-fruited Apple-trees, appearing in gardens as a tree-like shrub with erect slightly spreading branches, which are covered every spring with masses of fragrant pink or rose-colored flowers (*Garden and Forest*, i. 272, f. 214; ii. 260).

[10] Linnæus f. *Syst.* ed. 13, Suppl. 255. — Pallas, *Fl. Ross.* i. 20, t. 9; *Voyages*, v. 504, t. 11, f. 1. — *Nouveau Duhamel*, vi. 189, t. 56. — *Bot. Reg.* t. 514. — Decaisne, *l. c.* 310, t. 12. — Koch, *l. c.* 218.

[11] The Old World Sorbus (*Pyrus aucuparia*, Gærtner, *Fruct.* ii. 45, t. 87 [*Sorbus aucuparia*, Linnæus, *Spec.* 477. — Maximowicz, *l. c.* 170]), the Scottish Rowan-tree or Mountain Ash, is widely distributed through the forests of mountainous regions from the shores of the Atlantic Ocean to Japan, extending north to the arctic circle, where it is reduced to a stunted shrub. For centuries it has been a favorite tree with planters, and varieties with yellow and with orange-colored fruit and with pendulous branches have appeared. (See Gilpin, *Forest Scenery*, ed. 2, 138. — Loudon, *l. c.* 916.)

The fruit of the Rowan-tree is greedily devoured by birds, and it is often planted to supply them with food. The fruit is sometimes made into flour, or is eaten uncooked in northern Europe and in Siberia; infused with water it produces a pleasant subacid beverage, and by distillation a powerful spirit. The wood, which is hard and close-grained, is often used for the handles of tools and the cogs of wheels, and by wheelwrights and turners (Evelyn, *Silva*, ed. Hunter, i. 211. — Mathieu, *Flore Forestière*, ed. 2, 131).

[12] *Pyrus Aria* (Ehrhart, *Beitr.* iv. 20), the White Beam-tree, is distributed from western Europe to Japan, and is common in the

Many insects[1] feed upon the different species of Pyrus, which are also subject to serious fungal diseases.[2]

Pirus, the classical name of the Pear-tree, was changed to Pyrus by Tournefort,[3] and then adopted by Linnæus, who, in establishing his genus, united with Pyrus the Cydonia[4] and Malus[5] of Tournefort.

forests of northern Europe and Asia, in the mountainous regions of central and southern Europe, and of central, southern, and western Asia. It is valued by planters for the beauty of its entire or variously divided ample leaves, which are pale or sometimes nearly white on the lower surface, and for its subacid and astringent fruit, which is a favorite food of birds, and is sometimes made into flour and often fermented into a kind of beer or distilled into a powerful spirit.

The wood of the White Beam-tree is hard, strong, and durable, and is largely employed for the handles of tools and the bearings of machinery, and by wheelwrights and turners (Loudon, *Arb. Brit.* ii. 910. — Mathieu, *Flore Forestière*, ed. 2, 123).

[1] Many of the insects which injure the different species of Prunus in America also attack the native Apples, and Mountain Ashes are sometimes seriously injured by them. Tent-caterpillars and the larvæ of Tussock-moths are often abundant on the Apple, and the Mountain Ash suffers from attacks of the Fall Web-worm (*Hyphantria cunea*, Drury). *Datana ministra*, Drury, often completely defoliates the branches of small trees, and *Œdemasia concinna*, Smith & Abbot, commits similar depredations. Great destruction among the trees of this genus, and often their death, is caused by borers. The Apple-tree Borer (*Saperda bivittata*, Say) and the Flat-headed Borer (*Chrysobothris femorata*, Fabricius) are the most destructive to the Apple and the Mountain Ash. Several Scale-insects affect the bark and branches, the most harmful being the Scurfy Bark-louse (*Chionaspis furfurus*, Fitch) and *Mytilaspis pomicorticis*, Riley. The foliage is also injured by Aphids, and the fruit of the Wild Apple by the ravages of the Codlin-moth and a Curculio (*Anthonomus quadrigibbus*, Say). No less than eighty-one species of insects which attack the cultivated Apple in America are enumerated by Saunders (*Insects injurious to Fruits*, 13), and most of them may be discovered on the wild species also.

[2] Of the Fungi which attack the North American species of Pyrus, the most interesting are the different *Ræsteliæ*, found on the leaves and less frequently on the fruit and young stems of most of the species. The *Ræsteliæ*, commonly called Cluster-cups, belong to the order *Uredineæ* or Rusts, a group of plants which pass through several different stages in their development, in some of the stages appearing as parasites on certain genera of flowering plants, while in others they may be parasitic on entirely different genera. In the most highly differentiated Rusts there may be as many as four different stages during their development. The most destructive of these plants to our Wild Apples is *Ræstelia pyrata*, Thaxter, a Cluster-cup which usually grows in dense rings on the under side of the leaves of *Pyrus coronaria*, and sometimes on those of *Pyrus angustifolia* and several of the native species of Cratægus, and in a less striking form on the leaves of the cultivated Apple-tree. This species is peculiar to North America, and its teleutosporic stage is reached in the large yellow gelatinous masses common on the young branches of the Red Cedar in May. In the northern part of the country the leaves of the Mountain Ash, *Pyrus Americana*, exhibit large yellow spots, and on their under surface bear groups of long narrow Cluster-cups which appear identical with those of the European *Ræstelia cornuta*, Fries, although as yet the teleutosporic stage of this plant has not been detected in North America. Other fungi which attack the American species of Pyrus are *Entomosporium maculatum*, Levéillé, with curious ciliated spores, found commonly on the leaves of Quinces, Pears, and Apple-trees, as well as on Amelanchier and several species of Cratægus; and *Nummularia discreta*, Tulasne, most common on the branches of the Apple-tree, but sometimes seen on those of *Pyrus Americana*.

[3] *Inst.* 628, t. 404.

[4] *Inst.* 632, t. 405.

[5] *Inst.* 634, t. 406.

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

MALUS. Flowers in simple umbellate or racemose cymes on spur-like lateral branches; styles 3 to 5, more or less united below. Trees with small winter-buds, scaly bark, and simple leaves, involute in vernation.

- Calyx-lobes persistent; fruit depressed at the base.
  - Leaves ovate, truncate or subcordate at the base, incisely serrate, often lobed, membranaceous . . . . . 1. P. CORONARIA.
  - Leaves lanceolate-oblong, acute at the base, crenulate-serrate, or nearly entire, subcoriaceous . . . . . 2. P. ANGUSTIFOLIA.
- Calyx-lobes deciduous; fruit not depressed at the base.
  - Leaves ovate-lanceolate, serrulate, often 3-lobed . . . . . 3. P. RIVULARIS.

SORBUS. Flowers in compound leafy cymes; styles usually 3, free. Trees with large winter-buds, smooth aromatic bark, and odd-pinnate leaves, the leaflets conduplicate in vernation.

- Leaflets lanceolate, acuminate . . . . . 4. P. AMERICANA.
- Leaflets oblong-oval to lance-ovate, mostly obtuse . . . . . 5. P. SAMBUCIFOLIA.

PYRUS CORONARIA.

Crab Apple. Fragrant Crab.

LEAVES ovate, truncate or subcordate at the base, incisely serrate, often lobed, glabrous to tomentose on the lower surface.

Pyrus coronaria, Linnæus, *Spec.* 480. — Du Roi, *Harbk. Baumz.* ii. 229. — Marshall, *Arbust. Am.* 118. — Castiglioni, *Viag. negli Stati Uniti*, ii. 344. — Willdenow, *Berl. Baumz.* 265; *Spec.* ii. pt. ii. 1019; *Enum.* 527. — Persoon, *Syn.* ii. 40. — Pursh, *Fl. Am. Sept.* i. 340. — Nuttall, *Gen.* i. 307. — Hayne, *Dendr. Fl.* 86. — Torrey, *Fl. N. Y.* i. 223. — *Bot. Mag.* t. 2009. — Elliott, *Sk.* i. 559. — *Bot. Reg.* t. 651. — Sprengel, *Syst.* ii. 510. — De Candolle, *Prodr.* ii. 635. — Don, *Gen. Syst.* ii. 647. — Reichenbach, *Fl. Exot.* iv. t. 240. — Torrey & Gray, *Fl. N. Am.* i. 470. — Dietrich, *Syn.* iii. 154. — Chapman, *Fl.* 128. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 69. — Brunet, *Cat. Vég. Lig. Can.* 26. — Koch, *Dendr.* i. 214. — Wenzig, *Linnæa*, xxxviii. 40 (excl. var.). — *The Garden*, xix. 400, t. 280. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 66. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 72. — Watson & Coulter, *Gray's Man.* ed. 6, 164. — L. H. Bailey, *Am. Garden*, xii. 472. — Gray, *Forest Trees N. Am.* t. 52.

Malus coronaria, Miller, *Dict.* ed. 8, No. 2. — Moench, *Meth.* 682. — Michaux, *Fl. Bor.-Am.* i. 292. — Poiret, *Lam. Dict.* v. 562. — Desfontaines, *Hist. Arb.* ii. 140. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 427. — *Nouveau Duhamel*, vi. 139, t. 44, f. 1. — Michaux f. *Hist. Arb. Am.* iii. 65, t. 10. — Spach, *Hist. Vég.* ii. 136, t. 8. — Roemer, *Fam. Nat. Syn.* iii. 191. — Decaisne, *Nouv. Arch. Mus.* x. 154. — Carrière, *Rev. Hort.* 1877, 410, t.

Cratægus coronaria, Salisbury, *Prodr.* 357.

Malus microcarpa coronaria, Carrière, *Pommiers Microcarpes*, 133, f. 17; *Rev. Hort.* 1884, 104, f. 24.

A tree, twenty-five to thirty feet in height, with a trunk twelve or fourteen inches in diameter, dividing, eight or ten feet above the ground, into several stout spreading branches which form a wide open head; or usually much smaller and sometimes barely more than a bushy shrub with rigid contorted branches. The bark of the trunk is one third of an inch thick, and longitudinally fissured, the outer layer separating into long narrow persistent red-brown scales. The branchlets are at first coated with thick white tomentum which soon disappears, and in their first winter are glabrous or slightly pubescent and covered with bright red-brown bark marked by occasional small pale lenticels; in their second year they develop long stout spur-like and somewhat spinescent lateral branches, and are then light brown. The winter-buds are minute, obtuse, and protected by bright red scales with dark scarious ciliate margins; those of the inner ranks enlarge with the growing shoots and at maturity are from one third to one half of an inch in length, oblong, acute, bright red, and glandular-serrate. The leaves are ovate or sometimes almost triangular, usually acute at the apex, often truncate or subcordate, and occasionally acute at the base, incisely serrate with glandular teeth, and often three-lobed, especially on vigorous shoots; when they unfold they are red-bronze, coated on the lower surface with pale tomentum, and pilose on the upper surface; at maturity they are membranaceous, bright green above, and paler, glabrous, or sometimes slightly pilose below, three or four inches long, and an inch and a half to two inches and a half broad, with broad midribs and primary veins grooved on the upper side, and conspicuous veinlets, and are borne on slender petioles an inch and a half to two inches in length, tomentose or pubescent at first but ultimately glabrous and often furnished near the middle with two dark glands. The stipules are filiform, acuminate, half an inch long, and early deciduous. The flowers, which appear when the leaves are almost fully grown, are produced in five or six-flowered umbels on slender pedicels an inch and a half to two inches in length, and are an inch and a half to nearly two inches across when expanded, and very fragrant. The calyx-tube is obconic, and pubescent or coated with thick white tomentum; this also covers the inner surface of the long acute lobes which end in rigid subulate points. The petals, which are inserted remotely one from another, are white or rose-colored, obovate, rounded

above, contracted below into long narrow claws, often crenulately serrate or undulate and sometimes irregularly and unequally dentate near the base of the blade. The stamens are shorter than the petals and for one third of their length, by a partial twist of the filaments at the base, form a tube narrowed in the middle and enlarged above. The ovary and the lower part of the styles are coated with long pale hairs. The fruit, which ripens late in the autumn, is suspended on slender stems and is depressed-globose, and an inch to an inch and a half in diameter. It is green when first fully grown and when ripe is yellow-green, somewhat translucent, deliciously fragrant, and covered with a waxy exudation.

Pyrus coronaria is distributed in Canada from the valley of the Humber River westward along the shores of Lake Erie;[1] it ranges southward through western New York and Pennsylvania to the District of Columbia, and along the Alleghany Mountains to central Alabama, and westward to southern Minnesota, eastern Nebraska,[2] eastern Kansas, the Indian Territory, northern Louisiana, and eastern Texas.[3] It usually grows in rich rather moist soil in forest glades where it sometimes forms considerable thickets, or less commonly on dry limestone hills, and reaches its greatest size in the valleys of the lower Ohio basin and in the states west of the Mississippi River.

The wood of *Pyrus coronaria* is heavy and close-grained, but not hard or strong; it contains numerous obscure medullary rays, and is brown to light red, with thick yellow sapwood composed of eighteen or twenty layers of annual growth. The specific gravity of the absolutely dry wood is 0.7048, a cubic foot weighing 43.92 pounds. It is employed for levers, the handles of tools, and many small articles of domestic use.

The fruit is used for preserves and is often manufactured into cider.

Pyrus coronaria varies somewhat in the form of its leaves, in the amount and persistence of the tomentum which covers their under surface, the young shoots and the calyces, and in the size of the fruit; and, especially west of the Alleghany Mountains, the eastern plant passes into the variety *Ioensis*,[4] which is distinguished by its elliptic-oblong to ovate-oblong leaves irregularly obtusely toothed, and while young densely coated on the lower surface, like the young shoots, with thick white tomentum, and by its larger fruit which is sometimes two inches in diameter. This is the common form of the Crab-apple of the Mississippi valley.

Pyrus coronaria did not attract the attention of early travelers in America; it appears, however, to have been introduced into English gardens as early as 1724,[5] and was described by Philip Miller in the first edition of the *Gardener's Dictionary* published in 1731.[6]

As an ornamental plant the American Crab-apple has many attractions; its small size and excellent habit render it useful in shrubberies and small gardens; its flowers, which do not appear until after those of other Apple-trees have fallen, are large and sweet, and the fragrant fruit, hanging gracefully on its long stems and remaining on the branches until after the leaves have dropped, make it interesting late in the autumn. Its horticultural value was early appreciated by the settlers of the middle and

[1] Brunet, *Cat. Vég. Lig. Can.* 26. — Macoun, *Cat. Can. Pl.* i. 145.

[2] Bessey, *Bull. Agric. Exper. Stat. Nebraska*, iv. art. iv. 20.

[3] Coulter, *Contrib. U. S. Nat. Herb.* ii. 106 (*Man. Pl. W. Texas*).

[4] Wood, *Cl. Book*, rev. ed. 333.

Pyrus Ioensis, L. H. Bailey, *Am. Garden*, xii. 473, f. 7, 8.

The Soulard Crab, which was first introduced many years ago into Illinois, has been variously considered a large-fruited variety of *Pyrus coronaria*, a natural hybrid between this species and the cultivated Apple-tree, and a native species (*Pyrus Soulardi*, L. H. Bailey, *l. c.*). Probably the first view is correct, as various forms appear to connect it with eastern and western varieties of *Pyrus coronaria*. The leaves are round-ovate to elliptic-ovate, usually rounded at the apex, and acute or rounded at the base, irregularly crenate-dentate, three or four inches long and two and a half inches broad, with short thick petioles; they are thick, rugose, and, while young, are coated on the lower surface with thick pale tomentum. The fruit is two to two and a half inches in diameter or often much smaller, but in color, in the waxy exudation from the skin, and in the character of the flesh is not distinguishable from that of the eastern tree (Downing, *The Fruits and Fruit-Trees of America*, ed. 2, 426). This form, which is not common in a wild state, appears to be distributed from Minnesota to Texas (L. H. Bailey, *l. c.*).

[5] Aiton, *Hort. Kew.* ii. 176. — Loudon, *Arb. Brit.* ii. 908.

[6] *Malus; sylvestris, Virginiana, floribus odoratis*, No. 3.

Malus sylvestris, floribus odoratis, Clayton, *Fl. Virgin.* 55.

eastern states,[1] and for more than a century it has been a favorite garden plant in America and Europe.[2]

[1] "Crab-Trees are a species of wild apple-trees, which grow in the woods and glades, but especially on little hillocks, near rivers. In *New Jersey* the tree is rather scarce; but in *Pennsylvania* it is plentiful. Some people had planted a single tree of this kind near their farms, on account of the fine smells which its flowers afford. It had begun to open some of its flowers about a day or two ago; however, most of them were not yet open. They are exactly like the blossoms of the common apple-trees, except that the colour is a little more reddish in the *Crab-trees;* though some kinds of the cultivated trees have flowers which are very near as red: but the smell distinguishes them plainly; for the wild trees have a very pleasant smell, somewhat like the rasp-berry. The apples, or crabs, are small, sour, and unfit for anything but to make vinegar of. They lie under the trees all the winter, and acquire a yellow colour. They seldom begin to rot before spring comes on. The Crab-trees opened their flowers only yesterday and to-day; whereas, the cultivated apple-trees, which are brought from *Europe*, had already lost their flowers." (Kalm, *Travels*, English ed. ii. 166.)

[2] *Rev. Hort.* 1877, 410, t.

EXPLANATION OF THE PLATES.

Plate CLXVII. Pyrus coronaria.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. Vertical section of a flower, parts of the petals removed, enlarged.
4. An ovule, much magnified.
5. A fruiting branch, natural size.
6. Cross section of a fruit, natural size.
7. Vertical section of a fruit, natural size.
8. A seed, natural size.
9. Vertical section of a seed, enlarged.
10. An embryo, much magnified.
11. The base of a leaf showing stipules, natural size.
12. Winter-buds, natural size.

Plate CLXVIII. Pyrus coronaria, *var.* Ioensis.

1. A flowering branch, natural size.
2. Vertical section of a flower, the petals removed, enlarged.
3. A fruiting branch, natural size.
4. Vertical section of a fruit, natural size.
5. A seed, enlarged.
6. An embryo, magnified.
7. A vigorous leafy shoot, natural size.

C.E. Faxon del

Picart fr. sc.

PYRUS CORONARIA, L.

A Riocreux direx.

Imp. R. Taneur, Paris.

C.E Faxon del. Rapine sc.

PYRUS CORONARIA, var. IOENSIS, Wood.

A. Riocreux direx.t Imp. R. Taneur, Paris.

PYRUS ANGUSTIFOLIA.

Crab Apple.

LEAVES lanceolate-oblong, acute at the base, crenulate-serrate or nearly entire, subcoriaceous.

Pyrus angustifolia, Aiton, *Hort. Kew.* ii. 176. — Willdenow, *Spec.* ii. pt. ii. 1020. — Poiret, *Lam. Dict.* v. 455. — Persoon, *Syn.* ii. 40. — Pursh, *Fl. Am. Sept.* i. 340. — Elliott, *Sk.* i. 559. — Sprengel, *Syst.* ii. 509. — De Candolle, *Prodr.* ii. 635. — Watson, *Dendr. Brit.* ii. 132, t. 132. — *Bot. Reg.* t. 1207. — Don, *Gen. Syst.* ii. 647. — Torrey & Gray, *Fl. N. Am.* i. 471. — Dietrich, *Syn.* iii. 154. — Nuttall, *Sylva*, ii. 24. —Chapman, *Fl.* 128. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 69. — Koch, *Dendr.* i. 213. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 72. — Watson & Coulter, *Gray's Man.* ed. 6, 164. — L. H. Bailey, *Am. Garden*, xii. 472.

P. coronaria, Wangenheim, *Nordam. Holz.* 61, t. 21, f. 47 (not Linnæus). — Walter, *Fl. Car.* 148.

Malus angustifolia, Michaux, *Fl. Bor.-Am.* i. 292. — Decaisne, *Nouv. Arch. Mus.* x. 156.

Malus sempervirens, Desfontaines, *Hist. Arb.* ii. 141. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 428. — *Nouveau Duhamel*, vi. 138, t. 43, f. 1. — Poiret, *Lam. Dict.* Suppl. iv. 524. — Spach, *Hist. Vég.* ii. 135, t. 8. — Loiseleur, *Herb. Amat.* iii. t. 154. — Roemer, *Fam. Nat. Syn.* iii. 191.

P. coronaria, var. **angustifolia**, Wenzig, *Linnæa*, xxxviii. 41.

Chloromeles sempervirens, Decaisne, *Fl. des Serres*, xxiii. 156.

Malus microcarpa, sempervirens, Carrière, *Pommiers Microcarpes*, 136, f. 1. 18.

A tree, rarely attaining the height of thirty feet, with a short trunk eight or ten inches in diameter, and spreading rigid branches which form a wide open head. The bark of the trunk is from an eighth to a quarter of an inch in thickness, dark reddish brown, and divided by deep longitudinal fissures into narrow ridges, the surface of which is broken into small persistent plate-like scales. The young branches are clothed at first with pale pubescence which soon disappears; in their first winter they are slender and covered with smooth brown bark slightly tinged with red, and in their second year produce slender spinescent lateral branchlets, and are light brown and marked by occasional orange-colored lenticels. The winter-buds are obtuse, and one sixteenth of an inch long, their outer scales chestnut-brown and slightly pubescent, with ciliate scarious margins, the inner ones oblong, acute, coated with long pale hairs, accrescent with the young shoots, and a quarter of an inch long when fully grown. The leaves are lanceolate-oblong, acute or rounded and apiculate at the apex, acute at the base, and coarsely crenulate-serrate above the middle or sometimes almost entire; when they appear they are more or less coated with pale tomentum on the lower surface, and are pilose on the upper surface, and at maturity are subcoriaceous, dark green and lustrous above, paler below, and glabrous or nearly so, with slender midribs grooved on the upper side and obscure primary veins; they are then an inch and a half to three inches long and one half of an inch to an inch and a half broad, and are borne on slender rigid glabrous or puberulous petioles from three quarters of an inch to an inch in length. The stipules are filiform, rose-colored, half an inch long, and caducous. The flowers, which are an inch across when expanded, and very fragrant, appear from the end of March in Louisiana to the middle of May in Pennsylvania, and are produced in few-flowered umbels on slender pedicels an inch to an inch and a half in length, furnished near the middle with one or more inconspicuous glands, and are glabrous or sometimes, especially in the Gulf states, covered with pale tomentum. The calyx-tube is glabrous, pubescent, or tomentose on the outer surface, with narrow acuminate lobes, terminating in rigid points, and clothed on the inner surface with pale tomentum. The petals are distant, narrowly obovate, rounded above, contracted below into long slender claws, undulate and sometimes irregularly denticulate-serrate at the base of the blade, and white, pink, or rose-colored. The ovary and the lower part of the styles are densely clothed with pale

tomentum. The fruit is depressed-globose or sometimes slightly pyriform, and is from three quarters of an inch to an inch in diameter, pale yellow-green, and very fragrant when fully ripe, with hard acid flesh.

Pyrus angustifolia is distributed from Allegheny County, Pennsylvania,[1] and southern Delaware through the coast region of the southern Atlantic states to the valley of the Chattahoochee in western Florida, and through the Gulf states to the valley of the Red River in Louisiana, and northward to middle Tennessee. In the Atlantic states, where it is more common than in the country west of the Alleghany Mountains, *Pyrus angustifolia* usually grows in open forest glades in stiff clay soil near streams, and in the Gulf states in the sandy soil of dry depressions in rolling Pine-covered uplands.

The wood of *Pyrus angustifolia* is heavy, hard, and close-grained; it is light brown tinged with red, with thick yellow sapwood and many obscure medullary rays. The specific gravity of the absolutely dry wood is 0.6895, a cubic foot weighing 42.97 pounds. It is occasionally employed for levers, the handles of tools, and other small objects.

The fruit is used for preserves and is occasionally made into cider.

It was this tree, no doubt, that William Strachey found on the James River in 1610,[2] although it was not recognized by botanists until nearly the end of the next century, the earliest description having been drawn up from trees cultivated in England, where it was introduced in 1750[3] by Christopher Gray.[4]

The southern Crab-apple is occasionally cultivated in the gardens of Europe. When in flower it is not surpassed in beauty by any of the small trees of North America, and the traveler in the gloomy and monotonous Pine forests of the southern states experiences no more delightful sensation than when he comes unexpectedly into some retired glade and finds it filled with these trees covered by their delicate and fragrant flowers.

[1] *Pyrus angustifolia* was first noticed here by Professor Thomas C. Porter.

[2] "Crabb trees there be, but the fruict small and bitter, howbeit, being graffed upon, soone might we have of our owne apples of any kind, peares, and what ells." (*Historie of Travaile into Virginia Britannia*, ed. Major, 130.)

[3] Aiton, *Hort. Kew.* ii. 176. — Loudon, *Arb. Brit.* ii. 909, t.

[4] Christopher Gray established a nursery-garden at Fulham early in the eighteenth century, and appears to have been active in introducing North American plants, for Mark Catesby, in the preface to the *Hortus Britanno-Americanus*, published in 1767, remarks that "Mr. Gray at Fulham has for many years made it his business to raise and cultivate the plants of America (from whence he has annually fresh supplies) in order to furnish the Curious with what they want;" and that, "through his industry and skill a greater variety of American forest-trees and shrubs may be seen in his gardens, than in any other place in England." According to Loudon, the first plant of *Magnolia fœtida* which was brought to England was planted in Gray's nursery; it died in 1810, when it had formed a head twenty feet in diameter and a trunk nearly five feet in circumference (*Arb. Brit.* i. 76).

In 1755 Gray published a catalogue of the plants cultivated in his garden, which is supposed to have been written by Philip Miller.

EXPLANATION OF THE PLATE.

Plate CLXIX. Pyrus angustifolia.

1. A flowering branch, natural size.
2. Vertical section of a flower, parts of the stamens and petals removed, enlarged.
3. A fruiting branch, natural size.
4. Vertical section of a fruit, natural size.
5. A winter branchlet, natural size.

C E Faxon del. Picart fr. sc.

PYRUS ANGUSTIFOLIA, Ait.

A. Riocreux direx! Imp. R. Taneur, Paris

PYRUS RIVULARIS.

Oregon Crab Apple.

LEAVES ovate-lanceolate, serrulate, often 3-lobed, pubescent on the lower surface.

Pyrus rivularis, Douglas; Hooker, *Fl. Bor.-Am.* i. 203, t. 68. — Don, *Gen. Syst.* ii. 647. — Torrey & Gray, *Fl. N. Am.* i. 471. — Walpers, *Rep.* ii. 53. — Dietrich, *Syn.* iii. 154. — Ledebour, *Fl. Ross.* ii. 99. — Nuttall, *Sylva*, ii. 22, t. 49. — Torrey, *Bot. Wilkes Explor. Exped.* 292. — Koch, *Dendr.* i. 212. — Wenzig, *Linnæa*, xxxviii. 38. — Brewer & Watson, *Bot. Cal.* i. 188. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 73.

Pyrus diversifolia, Bongard, *Mém. Acad. Sci. St. Pétersbourg*, ser. 6, ii. 133.

Pyrus fusca, Rafinesque, *Med. Fl.* ii. 254.

Pyrus subcordata, Ledebour, *Fl. Ross.* ii. 95.

Malus rivularis, Roemer, *Fam. Nat. Syn.* iii. 215. — Decaisne, *Nouv. Arch. Mus.* x. 155.

Malus diversifolia, Roemer, *Fam. Nat. Syn.* iii. 215. — Decaisne, *Nouv. Arch. Mus.* x. 155.

Malus subcordata, Roemer, *Fam. Nat. Syn.* iii. 192.

Pyrus rivularis, β. **levipes**, Nuttall, *Sylva*, ii. 24.

A tree, thirty to forty feet in height, with a trunk twelve to eighteen inches in diameter; or often a shrub sending up from the ground many slender stems. The bark of the trunk is a quarter of an inch thick, the surface broken into large rather thin loose light red-brown plate-like scales. The winter-buds are obtuse, one sixteenth of an inch long, and covered by chestnut-brown scales rounded on the back and ciliate on the margins; the accrescent scales of the inner rows being lanceolate-acute when fully grown, usually bright red, and nearly half an inch long. The branches are at first coated with long pale hairs which are sometimes deciduous, and sometimes cover them more or less completely until the autumn; in their first winter they become bright red and lustrous, and later are dark brown and often marked by minute remote pale lenticels. The leaves are ovate-lanceolate, acute or acuminate at the apex, wedge-shaped or rounded at the base, sharply serrate with appressed glandular teeth, and occasionally, especially on vigorous shoots, obscurely three-lobed, with prominent midribs and primary veins grooved on the upper side, and conspicuously reticulate veinlets; when they unfold they are pubescent on the lower, and puberulous on the upper surface, and at maturity are thick and firm, dark green and glabrous above, and pale and slightly pubescent below, an inch to three inches long, and half an inch to an inch and a half broad, and are borne on stout rigid pubescent petioles an inch to an inch and a half in length. The stipules are narrowly lanceolate, acute, from one half to three quarters of an inch long, and caducous. In the autumn the leaves assume beautiful shades of orange and scarlet. The flowers, which are produced in short racemose many-flowered cymes leafy at the base, are borne on slender pubescent pedicels biglandular near the middle, and are half an inch across when expanded; the calyx-tube is narrowly obconic and glabrous or puberulous, with acute lobes, minutely apiculate, coated with dense pale tomentum on the inner surface, and deciduous from the mature fruit; the petals are orbicular to obovate, with erose or undulate margins; they are contracted below into short claws, and are as long as the two to four glabrous styles. The fruit, which ripens in September and October, is obovate-oblong, and from one half to three quarters of an inch in length, with thin dry flesh and large seeds; on some trees it is yellow-green when fully ripe, and on others it is light yellow with a red flush on one side, or sometimes is almost entirely red.

Pyrus rivularis is distributed from the Aleutian Islands southward along the coast and islands of Alaska and British Columbia[1] and through western Washington and Oregon to Sonoma and Plumas

[1] Richardson, *Arctic Searching Exped.* ii. 294. — Rothrock, *Smithsonian Rep.* 1867, 435 (*Fl. Alaska*). — G. M. Dawson, *Canadian Nat.* n. ser. ix. 330.

Counties, California.[1] It grows usually in deep rich soil in the neighborhood of streams, often forming almost impenetrable thickets of considerable extent, and attains its greatest size in the valleys of Washington and Oregon.

The wood of *Pyrus rivularis* is heavy, hard, and very close-grained, with a satiny surface susceptible of receiving a beautiful polish; it contains numerous obscure medullary rays, and is light brown tinged with red, with thick lighter colored sapwood composed of twenty-five to thirty layers of annual growth. The specific gravity of the absolutely dry wood is 0.8316, a cubic foot weighing 51.83 pounds. It is employed for mallets, malls, the handles of tools, and the bearings of machinery.

The fruit, which has a pleasant subacid flavor when fully ripe, is gathered and consumed by the Indians.[2]

Archibald Menzies,[3] who sailed with Vancouver as surgeon and naturalist late in the last century, appears to have been the first botanist to notice *Pyrus rivularis*, although its character was not distinguished until fifty years later.[4] In 1882 it was introduced from Oregon into the Arnold Arboretum, where it is perfectly hardy and flowers abundantly every year.[5]

[1] Greene, *Fl. Francis.* i. 53.

[2] "The fruit of the Crab-apple (*Pyrus rivularis*) is prepared for food by being wrapt in leaves and preserved in bags all winter. When the apples have become sweet, they are cooked by digging a hole in the ground, covering it over thickly with green leaves and a layer of earth or sand, and then kindling a fire above them." (R. Brown (Campst.), *Trans. Bot. Soc. Edinburgh*, ix. 383.)

[3] See ii. 90.

[4] Probably the earliest printed reference to this tree is in Georgi's *Geographisch-Physikalische und Naturhistorische Beschreibung des Russischen Reichs* (pt. iii. iv. 1015), published in 1800, where the wild Apple-tree seen by Schelechow on the Aleutian Islands is mentioned, but is regarded as a variety of the common Apple-tree.

[5] *Pyrus rivularis* is exceedingly rare in European gardens, and does not appear to have attracted the attention of European horticulturists. It is cultivated, however, in the garden of the Forest School at Münden, where it flowers and produces fruit.

EXPLANATION OF THE PLATE.

Plate CLXX. Pyrus rivularis.

1. A flowering branch, natural size.
2. Vertical section of a flower, the petals removed, enlarged.
3. Cross section of an ovary, enlarged.
4. A fruiting branch, natural size.
5. A fruit divided transversely, enlarged.
6. A winter branchlet, natural size.

C.E.Faxon del. Picart fr. sc.

PYRUS RIVULARIS, Dougl.

A.Riocreux direx.t Imp.R.Taneur, Paris.

PYRUS AMERICANA.

Mountain Ash.

LEAFLETS lanceolate, acuminate.

Pyrus Americana, De Candolle, *Prodr.* ii. 637. — Watson, *Dendr. Brit.* i. 54, t. 54. — Sprengel, *Syst.* ii. 511. — Hooker, *Fl. Bor.-Am.* i. 204. — Don, *Gen. Syst.* ii. 648. — Audubon, *Birds*, t. 363. — Torrey & Gray, *Fl. N. Am.* i. 472. — Torrey, *Fl. N. Y.* i. 224. — Dietrich, *Syn.* iii. 155. — Nuttall, *Sylva*, ii. 25, t. 50. — Emerson, *Trees Mass.* 439. — Lange, *Pl. Grœnl.* 134. — Provancher, *Flore Canadienne*, i. 209. — Chapman, *Fl.* 129. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 70. — Brewer & Watson, *Bot. Cal.* i. 189. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 73. — Watson & Coulter, *Gray's Man.* ed. 6, 164.

Sorbus Americana, Marshall, *Arbust. Am.* 145. — Willdenow, *Enum.* 520. — Pursh, *Fl. Am. Sept.* i. 341. — Poiret, *Lam. Dict.* Suppl. v. 164. — Nuttall, *Gen.* i. 305. — Hayne, *Dendr. Fl.* 75. — Spach, *Hist. Vég.* ii. 95. — Bigelow, *Fl. Boston.* ed. 3, 207. — Roemer, *Fam. Nat. Syn.* iii. 138. — Koch, *Dendr.* i. 190. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xix. 174 (*Mél. Biol.* ix. 171). — Wenzig, *Linnæa*, xxxviii. 71. — Decaisne, *Nouv. Arch. Mus.* x. 158.

Sorbus aucuparia, Poiret, *Lam. Dict.* vii. 234 (in part). — Bigelow, *Fl. Boston.* 119. — Decaisne, *Nouv. Arch. Mus.* x. 158 (in part).

Sorbus aucuparia, var. **Americana**, Persoon, *Syn.* ii. 38.

Pyrus aucuparia, Meyer, *Pl. Lab.* 81 (in part). — Schlechtendal, *Linnæa*, x. 99 (not Gærtner). — Hooker f. *Trans. Linn. Soc.* xxiii. 290, 327 (*Distribution Arctic Pl.*), in part.

A tree, twenty to thirty feet in height, with a trunk which rarely exceeds a foot in diameter, spreading slender branches, and stout branchlets; or more often a tall or sometimes a low shrub sending up many stems from the ground. The bark of the trunk is an eighth of an inch thick, with a smooth light gray surface irregularly broken by small appressed plate-like scales. The branchlets are slightly clothed at first with fine pubescence, but soon become glabrous, and in their first winter are brown tinged with red, marked by the large leaf-scars and remote pale oblong lenticular spots, and often covered with a faint glaucous bloom; in their second year they become darker, and the thin papery outer layer of bark is easily separable from the bright green and fragrant inner layers. The winter-buds are acute, from one quarter to three quarters of an inch long, and protected by dark vinous red acuminate scales rounded on the back, more or less pilose, and covered with a gummy exudation; the inner scales are coated in the bud with thick pale tomentum and enlarge with the growing shoots which, in falling, they mark with enduring narrow ring-like scars. The leaves are six to eight inches long, with slender grooved dark green or red petioles often furnished with tufts of dark hairs at the base of the petiolules and enlarged at the base, and from thirteen to seventeen leaflets; these are lanceolate, acute, taper-pointed, unequally wedge-shaped or rounded and entire at the base, and sharply serrate above, with acute often glandular teeth; they are sessile or shortly petiolulate, or the terminal one is sometimes borne on a stalk half an inch in length; when they unfold they are slightly pubescent on the lower surface, and at maturity are membranaceous, glabrous, dark yellow-green on the upper, and pale on the under surface, two to three inches long, and one half to two thirds of an inch broad, with prominent midribs grooved on the upper side, and thin veins. The stipules are broad and foliaceous, nearly triangular, variously cut, and caducous. The leaves turn a bright clear yellow before falling. The flowers, which appear after the leaves are fully grown toward the end of May or as late as July at the north and on the high Alleghany Mountains, are one eighth of an inch in diameter when expanded, and are borne on short stout pedicels in flat compound cymes three or four inches across. The bracts and bractlets are acute, minute, and caducous. The calyx is broadly obconic and puberulous, with short nearly triangular lobes tipped with minute glands, and half the length of the nearly orbicular creamy white petals which are contracted below into short claws. The fruit is a quarter of an inch

across, subglobose or slightly pyriform, and bright red, with thin acid flesh, a thick rather woody endocarp, and light chestnut-colored seeds rounded at the apex, acute at the base, more or less flattened by mutual pressure, and one eighth of an inch long. It ripens late in the autumn, and, unless eaten by birds, remains on the tree until the end of winter, when it separates from the stems, which often remain on the branches until the leaf-buds open in the spring.

Pyrus Americana is distributed from Newfoundland to Manitoba,[1] and extends southward through the maritime provinces of Canada, Quebec, and Ontario, the elevated portions of the northeastern United States, the region of the Great Lakes, and the high mountain ranges of Virginia and North Carolina. It is abundant in all the eastern provinces of Canada, where it grows in rich rather moist soil along the borders of swamps and on rocky hillsides, and probably attains its largest size on the northern shores of Lakes Huron and Superior; in the United States, except in northern New England, it is more often a shrub than a tree, growing usually on the Alleghany Mountains in the form of a low bush with narrower foliage and smaller fruit than the tree bears at the north.[2]

The wood of *Pyrus Americana* is close-grained, but light, soft, and weak; it is pale brown, with pale lighter colored sapwood composed of fifteen to twenty layers of annual growth, and contains numerous obscure medullary rays. The specific gravity of the absolutely dry wood is 0.5451, a cubic foot weighing 33.97 pounds.

The fruit of the American Mountain Ash is as astringent as that of the Old World species, contains the same principles, and can be used for the same purposes; in the United States it is sometimes employed domestically in infusions and decoctions,[3] and in homœopathic remedies.[4]

Pyrus Americana was first distinguished by Humphrey Marshall, the Pennsylvania botanist, who described it in his *Arbustum Americanum* in 1785,[5] although it is said to have been introduced into English gardens three years earlier.[6] It is sometimes planted in Canada and in the northern United States in the neighborhood of houses on account of the beauty of its fruit. This, however, is smaller and less highly colored than that of the second North American and of the European species.

[1] Brunet, *Cat. Vég. Lig. Can.* 26. — Bell, *Rep. Geolog. Surv. Can.* 1879–80, 54°. — Macoun, *Cat. Can. Pl.* i. 146.

[2] *Pyrus Americana*, var. *microcarpa*, Torrey & Gray, *Fl. N. Am.* i. 472. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 74.

Sorbus aucuparia, var. a., Michaux, *Fl. Bor.-Am.* i. 290.

Sorbus microcarpa, Pursh, *Fl. Am. Sept.* i. 341. — Poiret, *Lam. Dict.* Suppl. v. 164. — Elliott, *Sk.* i. 555. — Spach, *Hist. Vég.* ii. 95. — Roemer, *Fam. Nat. Syn.* iii. 138.

Pyrus microcarpa, Sprengel, *Syst.* ii. 511. — De Candolle, *Prodr.* ii. 636. — Don, *Gen. Syst.* ii. 648. — Loudon, *Arb. Brit.* ii. 921. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 71.

Sorbus Americana, var. *microcarpa*, Wenzig, *Linnæa*, xxxviii. 73.

Sorbus riparia, Rafinesque, *New Fl.* iii. 15.

[3] Rafinesque, *Med. Fl.* ii. 265. — Stillé & Maisch, *Nat. Dispens.* ed. 2, 1333.

[4] Millspaugh, *Am. Med. Pl. in Homœopathic Remedies*, i. 56, t. 56.

[5] John Josselyn includes in his list of plants mentioned in *New England's Rarities* the "Quick Beam or Wild Ash." This has been supposed to be the American Mountain Ash (see ed. Tuckerman, 98), and, although Josselyn probably never visited the part of New England where this tree grows naturally, he may well have learned of its existence from the Indians, who doubtless made use of the fruit.

[6] Loudon, *Arb. Brit.* ii. 920, t.

EXPLANATION OF THE PLATES.

Plate CLXXI. Pyrus Americana.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. An ovary divided transversely, enlarged.
4. Portion of a young branch showing stipules, natural size.

Plate CLXXII. Pyrus Americana.

1. A fruiting branch, natural size.
2. Vertical section of a fruit, enlarged.
3. Cross section of a fruit, enlarged.
4. Vertical section of a seed, enlarged.
5. An embryo, much magnified.
6. A winter-bud, natural size.

C. E. Faxon del. Picart fr. sc.

PYRUS AMERICANA, DC.

A. Riocreux direx.t Imp. R. Taneur, Paris

C.E.Faxon del. Picart fr. sc.

PYRUS AMERICANA, DC.

A.Riocreux direx.t Imp. R.Taneur, Paris.

PYRUS SAMBUCIFOLIA.

Mountain Ash.

LEAFLETS oblong-ovate to lance-ovate, mostly obtuse.

Pyrus sambucifolia, Chamisso & Schlechtendal, *Linnæa*, ii. 36. — Don, *Gen. Syst.* ii. 648. — Torrey & Gray, *Fl. N. Am.* i. 472. — Walpers, *Rep.* ii. 53. — Dietrich, *Syn.* iii. 155. — Watson, *King's Rep.* v. 92. — Brewer & Watson, *Bot. Cal.* i. 189. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 74. — Watson & Coulter, *Gray's Man.* ed. 6, 164.

Sorbus aucuparia, var. β., Michaux, *Fl. Bor.-Am.* i. 290.

Sorbus aucuparia, Schrank, *Pfl. Lab.* 25 (in part; not Linnæus).

Pyrus Americana, Newberry, *Pacific R. R. Rep.* vi. 73 (not De Candolle). — Cooper, *Pacific R. R. Rep.* xii. pt. ii. 60. — Torrey, *Bot. Wilkes Explor. Exped.* 292.

Pyrus aucuparia, Meyer, *Pl. Lab.* 81 (in part). — Schlechtendal, *Linnæa*, x. 99 (in part). — Hooker, *Trans. Linn. Soc.* xxiii. 290, 327 (in part).

Sorbus sambucifolia, Roemer, *Fam. Nat. Syn.* iii. 139. — Wenzig, *Linnæa*, xxxviii. 73. — Decaisne, *Nouv. Arch. Mus.* x. 159.

Sorbus Sitchensis, Roemer, *Fam. Nat. Syn.* iii. 139.

A tree, occasionally thirty feet in height, with a trunk sometimes a foot in diameter, and spreading branches which form a round handsome head; or often on the mountains of western America a low shrub. The bark of the trunk is a quarter of an inch thick, with a smooth gray satiny surface sometimes broken by small appressed scales. The branchlets are at first glabrous, pubescent, or pilose with long pale hairs, and in their first winter are brown tinged with red and are marked by scattered oblong lenticular spots. The winter-buds are acute, often three quarters of an inch to an inch in length, and in the shape, color, and texture of the scales which cover them hardly distinguishable from those of *Pyrus Americana*. The leaves are four to six inches long, with stout grooved and usually bright red petioles often tufted with dark hairs at the base of the petiolules, and seven to thirteen oblong-oval or lance-ovate leaflets; these are generally blunt and rounded, or abruptly short-pointed, or acuminate at the apex, unequally wedge-shaped at the base, entire or undulate below, and sharply and often doubly serrate above the middle, with spreading and sometimes glandular teeth; when they unfold they are pubescent on the lower surface, and at maturity are glabrous, dark green above, and pale below, with inconspicuous midribs and veins, and are sessile or short-petiolulate, or the terminal one long-stalked, and an inch and a half to two inches in length and one half to three quarters of an inch in breadth. The stipules are lanceolate to triangular, foliaceous, from one half to three quarters of an inch long, and early deciduous. The leaves turn a deep orange-color in the autumn before falling. The flowers, which appear in the early part of July, are produced in small dense pubescent cymes two to three inches across; they are a quarter of an inch in diameter when fully expanded, and are borne on slender clavate pedicels twice the length of the obconic calyx; this is glabrous or puberulous on the outer surface with narrow acute rigidly pointed lobes ciliate on the margins and much shorter than the obovate petals which are rounded above and contracted below into short claws. The fruit is subglobose, bright scarlet, and sometimes nearly half an inch in diameter, and is produced in dense red-branched clusters.

Pyrus sambucifolia is distributed from southern Greenland[1] to Labrador[2] and the high mountains of northern New England, and ranges westward along the northern shores of the Great Lakes to those of Little Slave Lake, through the Rocky Mountains to Alaska[3] and Kamschatka,[4] and through

[1] Hooker f. *Trans. Linn. Soc.* xxiii. 290, 327 (*Distribution Arctic Pl.* ii.).

[2] Meyer, *Pl. Lab.* 81.

[3] Bongard, *Mém. Acad. Sci. St. Pétersbourg*, ser. 6, ii. 133. — Rothrock, *Smithsonian Rep.* 1867, 446 (*Fl. Alaska*). — Macoun, *Cat. Can. Pl.* i. 146.

[4] Ledebour, *Fl. Ross.* ii. 99.

northeastern Asia[1] and the Kurile Islands[2] to Japan,[3] extending south in western America along all the mountain ranges of the interior[4] and western part of the continent to southern New Mexico, and to the neighborhood of the Yosemite valley in central California.[5] It inhabits the margins of cold wet alpine swamps and the borders of streams, and probably attains its greatest size in northern New England, where it grows at higher elevations above the level of the sea than *Pyrus Americana*, and in the region immediately north and west of Lake Superior.

The wood of *Pyrus sambucifolia* is close-grained but soft, light, and weak; it is light brown, with thin lighter colored sapwood and obscure medullary rays. The specific gravity of the absolutely dry wood is 0.5928, a cubic foot weighing 36.94 pounds.

Pyrus sambucifolia was first distinguished by the French botanist Michaux, who found it in Canada late in the last century. In cultivation it has been usually confounded with *Pyrus Americana*, from which it is best distinguished by its smaller cymes, its larger and later flowers and much larger fruit, and its usually more obtuse and broader leaflets. The large and brilliant fruit of this tree makes it the handsomest of all the Mountain Ashes, and it is a common ornament of gardens in northern Vermont and New Hampshire and in northern Michigan, Wisconsin, and Minnesota, where it often grows to a large size and during the autumn and early winter is a conspicuous and beautiful object.[6]

[1] Trautvetter & Meyer, *Fl. Ochot.* 37. — Maximowicz, *Prim. Fl. Amur.* 103.

[2] Miyabe, *Mem. Bost. Soc. Nat. Hist.* iv. 232 (*Fl. Kurile Islands*).

[3] Franchet & Savatier, *Enum. Pl. Jap.* i. 140. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xix. 174 (*Mél. Biol.* ix. 171).

[4] Coulter, *Man. Rocky Mt. Bot.* 89.

[5] The subalpine form of the high mountains of Washington, Oregon, and California, a low shrub with small cymes and with leaves composed of seven to eleven oblong or elliptic-obovate leaflets usually serrate only towards the apex, has been regarded as a distinct species (*Sorbus pumila*, Rafinesque, *Med. Fl.* ii. 265. — *Pyrus occidentalis*, Watson, *Proc. Am. Acad.* xxiii. 263 [*Sorbus occidentalis*, Greene, *Fl. Francis.* i. 54]), but intermediate forms appear to connect it with the northern and eastern tree, and it is perhaps better to consider it a variety of that species (var. *pumila*) until the American Mountain Ashes, which should perhaps be considered geographical varieties of one widely distributed species, are better understood than they are at present.

[6] *Pyrus sambucifolia* requires a northern climate with long cold winters to develop all its beauties, and it does not flourish even in eastern New England, where it is a less beautiful plant than the Old World Mountain Ash.

EXPLANATION OF THE PLATES.

Plate CLXXIII. Pyrus sambucifolia.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. An ovary divided transversely, enlarged.
4. Portion of a young branch showing stipules, natural size.

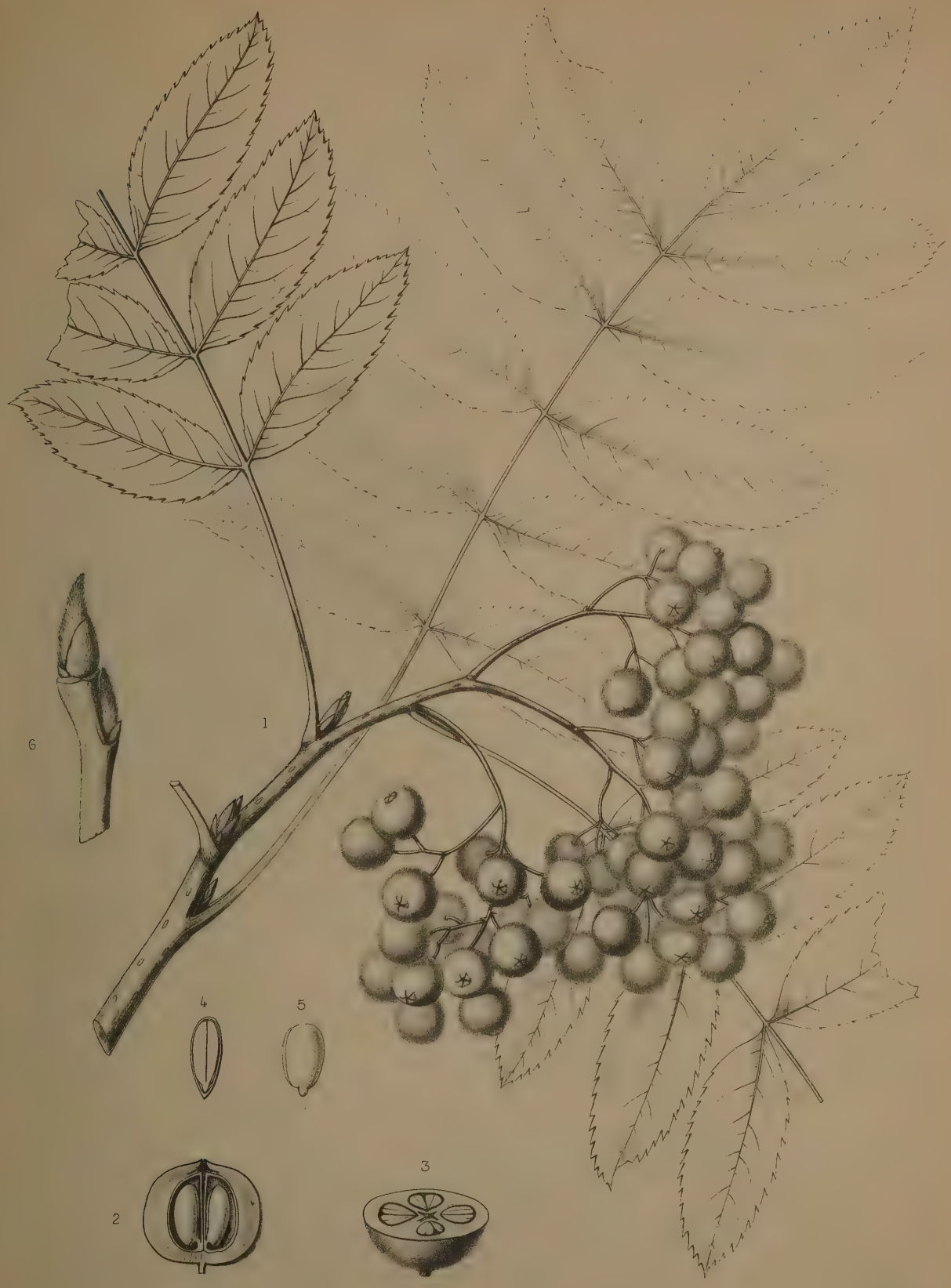
Plate CLXXIV. Pyrus sambucifolia.

1. A fruiting branch, natural size.
2. Vertical section of a fruit, enlarged.
3. Cross section of a fruit, enlarged.
4. Vertical section of a seed, enlarged.
5. An embryo, much magnified.
6. Winter-buds, natural size.

C.E.Faxon del. Picart fr. sc

PYRUS SAMBUCIFOLIA, Cham. et Schlecht.

A.Riocreux direx.t Imp. R.Taneur, Paris.



C.E. Faxon del

Picart fr sc

PYRUS SAMBUCIFOLIA, Cham et Schlecht.

A. Riocreux direx t

Imp. R. Taneur, Paris.

CRATÆGUS.

FLOWERS regular, perfect; calyx 5-lobed, the lobes imbricated in æstivation; petals 5, imbricated in æstivation; stamens usually 10 to 20; ovary 1 to 5-celled; ovules 2 in each cell, ascending. Fruit a drupaceous pome with bony nutlets. Leaves alternate, simple, lobed or pinnatifid.

Cratægus, Linnæus, *Gen.* 143. — Adanson, *Fam. Pl.* ii. 296. — A. L. de Jussieu, *Gen.* 335. — Meisner, *Gen.* 106. — Endlicher, *Gen.* 1239. — Bentham & Hooker, *Gen.* i. 626. — Baillon, *Hist. Pl.* i. 475.
Oxyacantha, Ruppius, *Fl. Jen.* ed. 3, 136. — Medicus, *Phil. Bot.* i. 150.
Halmia, Roemer, *Fam. Nat. Syn.* iii. 101.
Anthomeles, Roemer, *Fam. Nat. Syn.* iii. 102.
Phænopyrum, Roemer, *Fam. Nat. Syn.* iii. 103.
Phalacros, Wenzig, *Linnæa*, xxxviii. 164.

Trees or shrubs, with scaly bark, rigid terete and usually armed branches, small winter-buds covered by imbricated scales, those of the inner rows accrescent and often colored, and fibrous roots. Leaves alternate, petiolate, conduplicate in vernation, simple, and generally serrate or more or less lobed or pinnatifid, membranaceous or coriaceous, commonly deciduous; stipules often glandular-serrate, deciduous, lanceolate, acuminate, minute, or, on vigorous shoots, ample, foliaceous, usually lunate and stalked. Flowers pedicellate, in cymose panicled or slightly racemose corymbs, terminal on leafy lateral branches developed from the axils of leaves of the previous year. Bracts and bractlets linear, caducous, often colored, in falling marking the slender branches of the inflorescence and the pedicels with persistent gland-like scars. Calyx-tube urceolate or campanulate, five-lobed or divided, the lobes reflexed after anthesis, entire or glandular-serrate, persistent or deciduous. Disk adnate to the interior of the calyx-tube, thin or fleshy, entire, lobed or slightly sulcate, concave or somewhat convex. Petals five, inserted on the margin of the disk in the mouth of the calyx-tube, orbicular, spreading, entire or sinuate margined, white or rose-colored. Stamens ten to twenty, or indefinite, inserted with the petals in one to three rows; filaments filiform, subulate, incurved, often persistent on the ripe fruit; anthers oblong, attached on the back below the middle, introrse, two-celled, the cells opening longitudinally, pale, rose-colored, or violet-purple. Ovary inferior, composed of one to five carpels inserted in the bottom of the calyx-tube and united with it; styles terminal, contracted or slightly spreading, free, persistent on the ripe nutlets; stigmas terminal, dilated, truncate; ovules two in each cell, ascending, collateral, anatropous; raphe dorsal, the micropyle inferior. Fruit drupaceous, ovate or globose, red, yellow, or black, usually somewhat open or concave at the summit; sarcocarp dry and mealy; endocarp composed of one to five one-celled slightly united nutlets, variously sulcate and, when more than one, flattened on the inner faces by mutual pressure. Seeds solitary by the abortion of one of the ovules, erect, compressed, exalbuminous; testa membranaceous. Embryo filling the cavity of the seed; cotyledons plano-convex; radicle short, inferior.

Cratægus is widely and generally distributed through the temperate regions of the northern hemisphere. About forty species, nearly equally divided between the Old World and the New, can be distinguished. Fourteen are found within the territory of the United States, a larger number of species occurring in the region between the Red and the Trinity Rivers in western Louisiana and eastern Texas than in any other district of similar extent.[1] Three species at least occur in Mexico,[2] and of these

[1] This region, which is one of the most interesting in North America for the student of trees, must be considered the headquarters of the genus Cratægus, which makes here a conspicuous feature of the vegetation. More species occur here together than anywhere else, individuals of several of them growing to a greater size and in greater numbers than in any other part of the country.

[2] Hemsley, *Bot. Biol. Am. Cent.* i. 379.

one[1] ranges southward to the mountains of Ecuador, the most southern country which any member of the genus is known to reach. In Europe, where Cratægus is distributed from Scandinavia to the shores of the Mediterranean and from the Atlantic to the Black Sea, fourteen species are now generally recognized;[2] in the Orient[3] six endemic species are known; two occur in the Himalayan regions of central Asia,[4] and three in China and Japan.[5]

Cratægus has few useful properties. The wood of all the species is heavy, hard and solid, and is sometimes used for levers, the handles of tools, and other small articles.[6] In the United States the fruit of some of the species is made into jellies and preserves, and in northern China the fruit of *Cratægus pinnatifida*[7] is employed for the same purpose.[8] The Old World *Cratægus Oxyacantha*,[9] the most widely distributed plant of the genus, is sometimes cultivated in Afghanistan and the northwestern Himalayas as a fruit-tree,[10] and in some parts of Europe its fruit is fermented and used to strengthen cider and perry.[11] Many of the species are esteemed as ornamental plants, and *Cratægus Oxyacantha*, with its numerous varieties developed in cultivation, has been for centuries a favorite park and hedge plant in Europe.[12]

The American species of Cratægus are preyed upon by numerous insects,[13] and are often injured by serious fungal diseases.[14]

The generic name, from κράτος, refers to the strength of the wood produced by the different species.

[1] *Cratægus stipulosa*, Steudel, *Nom. Bot.* ed. 2, i. 434.

Mespilus stipulosa, Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 213. — Kunth, *Syn. Pl. Æquin.* iii. 462.

[2] Nyman, *Conspect. Fl. Europ.* 243.

[3] Boissier, *Fl. Orient.* ii. 660.

[4] Hooker f. *Fl. Brit. Ind.* ii. 383.

[5] Franchet & Savatier, *Enum. Pl. Jap.* i. 140. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg.* xix. 176 (*Mél. Biol.* ix. 175). — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 259.

[6] The wood of *Cratægus Oxyacantha* has been found the best substitute for Boxwood in wood-engraving (Jackson, *Commercial Botany of the 19th Century*, 156).

[7] Bunge, *Mém. Sav. Étr. St. Pétersbourg*, ii. 100 (*Enum. Pl. Chin. Bor.* 26). — Franchet, *Pl. David.* 118. — Maximowicz, *l. c.* — Forbes & Hemsley, *l. c.*

[8] Bretschneider, *Early European Researches into the Flora of China*, 127.

[9] Linnæus, *Spec.* 477. — De Candolle, *Prodr.* ii. 628. — Boissier, *l. c.* 664. — Hooker f. *l. c.*

[10] Brandis, *Forest Fl. Brit. Ind.* 207.

[11] Loudon, *Arb. Brit.* ii. 837.

[12] *Cratægus Oxyacantha* is widely and generally distributed through the forests of Europe and central Asia; for many centuries it has been cultivated in Europe as a hedge plant, for which purpose it is fitted by its rigid and well-armed branches, and Hawthorn hedges are common in all parts of Great Britain, where, too, this tree is a conspicuous and beautiful feature in all parks and many gardens. (See Loudon, *l. c.*) The Hawthorn was early introduced into the United States, but the heat and dryness of our summers cause the growth of many fungal enemies on its foliage and fruit, and its beauty is thus destroyed early in the season.

[13] American Hawthorns are attacked by many insects which prey particularly on their foliage. Packard (*5th Rep. U. S. Entomolog. Comm.* 1886–1890, 532) enumerates forty-six species which afflict the trees of this genus in the United States; these have been noted chiefly in the eastern part of the continent. Tent-caterpillars, Fall Web-worms, and Canker-worms sometimes infest our Hawthorns to such an extent as to make them a danger to neighboring orchards. Most of the insects which live upon Prunus and Pyrus attack Hawthorns also, in addition to other species which are peculiar to them. The larvæ of several species of Catocala have been found feeding on these trees as well as a number of leaf-miners, among which are *Nepticula cratægifoliella*, Clemens, *Ornix cratægifoliella*, Clemens, *Lithocolletis cratægella*, Clemens, and others. Aphids and mites also affect the foliage, and the trunks are often injured by Apple-tree Borers. Certain species of Curculio, like *Anthonomus Cratægi*, Walsh, *Conotrachelus Naso*, Leconte, and *Conotrachelus posticatus*, Say, live within the fruit.

[14] Different *Rœsteliæ* occur on the fruit and young branches of most of the American species of Cratægus as well as on Pyrus and Amelanchier, and a Cluster Cup, *Rœstelia pyrata*, Thaxter, makes rings on the under surface of the leaves of several species. Among other fungi which attack Cratægus are *Entomosporium maculatum*, Levéillé, with curious ciliated spores, and most of the species which attack Pyrus can be found also on Cratægus.

CONSPECTUS OF THE NORTH AMERICAN SPECIES.

Flowers in ample many-flowered corymbs.
- Fruit subglobose, black or blue.
  - Leaves broadly obovate to oblong-ovate . . . . . 1. C. DOUGLASII.
  - Leaves lanceolate-oblong to ovate . . . . . 2. C. BRACHYACANTHA.
- Fruit large, subglobose or pyriform, scarlet or rarely yellow.
  - Leaves subcoriaceous, obovate-cuneiform to broadly ovate or linear-oblong . . . . 3. C. CRUS-GALLI.
  - Leaves membranaceous, round-ovate, acutely incised, usually glabrous . . . . . 4. C. COCCINEA.
  - Leaves membranaceous, broadly ovate, acutely incised, pubescent on the lower surface . . . . . 5. C. MOLLIS.
  - Leaves ovate to ovate-oblong . . . . . 6. C. TOMENTOSA.
  - Leaves wedge-obovate, prominently veined . . . . . 7. C. PUNCTATA.
- Fruit small, depressed-globose, scarlet.
  - Leaves submembranaceous, spatulate or oblanceolate . . . . . 8. C. SPATHULATA.
  - Leaves broadly ovate or triangular . . . . . 9. C. CORDATA.
  - Leaves ovate to ovate-oblong or oblong-obovate . . . . . 10. C. VIRIDIS.
  - Leaves orbicular to broadly ovate, pinnately 5 to 7-cleft . . . . . 11. C. APIIFOLIA.

Flowers in simple few-flowered corymbs.
- Fruit pyriform or subglobose, red or greenish yellow.
  - Leaves cuneate-obovate or rhombic-obovate . . . . . 12. C. FLAVA.
  - Leaves obovate, spatulate . . . . . 13. C. UNIFLORA.
- Fruit red, globose.
  - Leaves elliptical to oblong-cuneiform . . . . . 14. C. ÆSTIVALIS.

CRATÆGUS DOUGLASII.

Haw.

FRUIT black. Leaves broadly obovate to oblong-ovate.

Cratægus Douglasii, Lindley, *Bot. Reg.* t. 1810. — Koch, *Dendr.* i. 147. — Kaleniczenko, *Bull. Mosc.* xlviii. pt. ii. 26. — Brewer & Watson, *Bot. Cal.* i. 189. — Engelmann, *Bot. Gazette*, vii. 128. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 75. — Greene, *Fl. Francis.* i. 53.

Cratægus punctata, var. brevispina, Douglas; Hooker, *Fl. Bor.-Am.* i. 201.

Cratægus sanguinea, var. Douglasii, Torrey & Gray, *Fl. N. Am.* i. 464. — Walpers, *Rep.* ii. 58. — Dietrich, *Syn.* iii. 160. — Wenzig, *Linnæa*, xxxviii. 135. — Torrey, *Bot. Wilkes Explor. Exped.* 292. — Regel, *Act. Hort. Petrop.* i. 116.

Cratægus sanguinea, Nuttall, *Sylva*, ii. 6, t. 44 (not Pallas). — Cooper, *Am. Nat.* iii. 407.

Anthomeles Douglasii, Roemer, *Fam. Nat. Syn.* iii. 140.

Cratægus rivularis, Brewer & Watson, *Bot. Cal.* i. 189 (not Nuttall). — Greene, *Fl. Francis.* i. 53.

A tree, thirty to forty feet in height, with a straight stout trunk eighteen inches to two feet in diameter, dividing into many branches which form a compact round head, and slender rigid branchlets; or often a tall shrub throwing up many stems, or, in the dry climate of the interior of the continent, a low intricately branched bush. The bark of the trunk is a quarter of an inch thick, longitudinally fissured, and broken into oblong plates, the surface of which separates into long thick dark red-brown scales. The branchlets are glabrous, green when young, and in their first winter bright red and lustrous, and marked by pale elevated lenticels; they are sometimes unarmed, but usually bear stout straight or slightly curved blunt or acute spines, three quarters of an inch to an inch in length, which are bright red in their first year, and, like the branches, later become ashy gray. The winter-buds are obtuse, one eighth of an inch long, and covered by broadly ovate scales which are keeled on the back, apiculate, ciliate on the margins, bright chestnut-brown, and lustrous. The leaves are broadly ovate to oblong-ovate, acute at the apex, gradually contracted at the base into short broad petioles, finely serrate except at the base with small glandular teeth, and often incisely cut towards the apex, or more or less three-lobed, especially on vigorous shoots; when they unfold they are puberulous on both surfaces, and at maturity are glabrous, thick, and rather coriaceous, dark green and often lustrous above, and paler below, one to four inches in length, and half an inch to an inch and a half in breadth. The stipules are narrowly obovate, acuminate, glandular-serrate, and caducous, or, on vigorous shoots, are foliaceous, broadly ovate-falcate, deeply incised, glandular-serrate, and short-stalked. The flowers are produced in broad or narrow leafy many-flowered cymes, furnished with lanceolate acuminate caducous bracts and bractlets; they appear in May when the leaves are nearly fully grown, and are from one third to one half of an inch across, with broadly obconic calyx-tubes, glabrous or puberulous, and nearly as long as the lanceolate calyx-lobes, which are acute or rounded at the apex, entire, ciliate-margined or finely glandular-serrate, and green or tinged with red or purple. The petals are pure white, broadly obovate, rounded above, and contracted below into short claws, and are rather longer than the stamens which have stout filaments and small pale anthers and than the short styles which vary in number from two to five, and are often furnished at the base with tufts of long pale hairs. The fruit, which falls as soon as it ripens in August and September, is subglobose or rarely somewhat oblong, black, and lustrous, with thin sweet flesh and small thin-walled nutlets slightly grooved on the back.

Cratægus Douglasii is distributed from the valley of the Parsnip River in British Columbia[1]

[1] Macoun, *Cat. Can. Pl.* i. 148.

through Washington and Oregon to the valley of the Pitt River in California, and ranges southward through Idaho and Montana to the valley of the Flat Head River at the western base of the Rocky Mountains. It is found in wet sandy soil in the neighborhood of streams, where it often forms impenetrable thickets of considerable extent, and is most abundant and attains its greatest size in the valleys of western Oregon and northern California.

The wood of *Cratægus Douglasii* is heavy, hard, tough, and close-grained, with a satiny surface susceptible of receiving a beautiful polish; it is rose-colored, with thick pale sapwood composed of thirty to forty layers of annual growth, and contains many thin medullary rays. The specific gravity of the absolutely dry wood is 0.6950, a cubic foot weighing 43.31 pounds. It is used for wedges, malls, and the handles of tools. The fruit, which is produced in great profusion, is a favorite article of food with the Indians.

In the dry interior parts of the continent *Cratægus Douglasii* is represented by the variety *rivularis*,[1] which, in its extreme form, is distinguished by narrowly lanceolate simply serrate membranaceous pale leaves; but in northern Montana, where the black-fruited Thorns abound, it passes into the form with larger thicker incisely cut leaves, the plants in one thicket often showing both the extreme and all the intermediate varieties of foliage ever produced by this tree.

Cratægus Douglasii, var. *rivularis*, is usually a low intricately branched armed or unarmed shrub. It is common in the coast region of Oregon, and is the usual form in the region bordering the shores of Puget Sound; it ranges southward to Sierra and Plumas Counties, California,[2] and extends over all the mountain ranges of eastern Oregon and Washington; it abounds on those of Idaho, Montana, and Utah, and spreads through Colorado[3] to the Pinos Altos Mountains of New Mexico, and grows along the borders of streams and mountain meadows, generally at high elevations.

Cratægus Douglasii was discovered by David Douglas[4] in the valley of the lower Colorado River, and in 1826 or 1827 was introduced by him into the garden of the London Horticultural Society, where it flowered ten years later.

In cultivation *Cratægus Douglasii* is a rapidly growing round-headed tree, soon attaining in good soil a height of eighteen or twenty feet; it is hardy on the Atlantic coast as far north as Nova Scotia, and in eastern Massachusetts covers itself every year with its handsome flowers and abundant black fruit.[5]

[1] Sargent, *Garden and Forest*, ii. 400.

Cratægus rivularis, Nuttall; Torrey & Gray, *Fl. N. Am.* i. 464. — Dietrich, *Syn.* iii. 161. — Walpers, *Rep.* ii. 58. — Nuttall, *Sylva*, ii. 9. — Regel, *Act. Hort. Petrop.* i. 107. — Watson, *King's Rep.* v. 92. — Engelmann, *Bot. Gazette*, vii. 128. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 74. — Macoun, *Cat. Can. Pl.* i. 522.

Mespilus rivularis, Wenzig, *Linnæa*, xxxviii. 137; *Bot. Centralbl.* xxxv. 342.

[2] Greene, *Fl. Francis.* i. 53.

[3] Coulter, *Man. Rocky Mt. Bot.* 88.

[4] See ii. 94.

[5] *Garden and Forest*, i. 201.

EXPLANATION OF THE PLATES.

Plate CLXXV. Cratægus Douglasii.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. Vertical section of a flower, enlarged.
4. Front and back views of a stamen, enlarged.
5. An ovule, much magnified.
6. A fruiting branch, natural size.
7. A fruit with a part of the flesh removed, showing the nutlets, enlarged.
8. A nutlet natural size.
9. A nutlet divided transversely, enlarged.
10. Vertical section of a nutlet, enlarged.
11. A seed, enlarged.
12. An embryo, much magnified.
13. A leaf from a young shoot with stipules, natural size.
14. Winter-buds, natural size.

Plate CLXXVI. Cratægus Douglasii, *var.* rivularis.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. Cross section of a fruit, enlarged.
5. A nutlet, natural size.
6. A nutlet divided transversely, enlarged.

C.E. Faxon del. Pucart sc

CRATÆGUS DOUGLASII, Lindl.

A. Riocreux direx.t Imp. R. Taneur, Paris.

C.E. Faxon del. Rapine sc.

CRATÆGUS DOUGLASII, Var. RIVULARIS, Sarg.

A. Riocreux direx.t Imp. R. Taneur, Paris

CRATÆGUS BRACHYACANTHA.

Pomette Bleue. Hog's Haw.

FRUIT bright blue. Leaves lanceolate-oblong to ovate.

Cratægus brachyacantha, Sargent & Engelmann; Engelmann, *Bot. Gazette*, vii. 128. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 75. — Otto Kuntze, *Rev. Gen. Pl.* i. 215.

Cratægus spathulata, Hooker, *Compan. Bot. Mag.* i. 25 (not Michaux).

A tree, forty to fifty feet in height, with a straight trunk eighteen or twenty inches in diameter, dividing, five or ten feet from the ground, into stout spreading light gray branches which form a broad compact round head. The bark of the trunk is a quarter of an inch thick, dark brown, deeply furrowed, and broken into long persistent scales. The branchlets are at first light green and slightly pubescent, but soon become glabrous and pale red-brown, and in their second year are stout, more or less zigzag, and ashy gray; they are armed with numerous short stout generally curved or sometimes straight and slender spines, from one third to two thirds of an inch in length, which often terminate lateral branchlets on vigorous shoots. The winter-buds are obtuse, nearly globose, one sixteenth of an inch across, and protected by chestnut-brown suborbicular scales ciliate on the margins and rounded on the back, those of the inner ranks being accrescent with the young shoots, and at maturity foliaceous, obovate, rounded above, nearly entire, and from one third of an inch to nearly an inch in length. The leaves are deciduous, and are lanceolate-oblong to ovate or rhombic, acute or rounded at the apex, gradually contracted into short broad petioles, and crenulate-serrate with minute appressed apiculate teeth; when they unfold they are slightly puberulous on the upper, and glabrous on the under surface, and at maturity are thick, subcoriaceous, dark green, and lustrous, with thin inconspicuous midribs and veins, and are one inch to two inches in length and half an inch to nearly an inch in breadth. The stipules are minute, subulate, one eighth of an inch long, and caducous. On vigorous shoots the leaves are sometimes broadly ovate or almost triangular, wedge-shaped, truncate, or heart-shaped at the base and more or less deeply three-lobed, and are two and a half inches long and two inches broad, with foliaceous broadly ovate to triangular-oblong acute stalked stipules an inch in length, and early deciduous. The flowers, which appear toward the end of April and early in May, when the leaves are nearly fully grown, are one third of an inch across when expanded, and are produced in great profusion on lateral spur-like branchlets in glabrous umbellate corymbs with long slender branches. The bracts and bractlets, which are narrowly lanceolate, acuminate, from one quarter to one half of an inch in length and tinged with red, fall when the flower-buds are half grown, leaving minute gland-like scars. The pedicels are half an inch long, or four or five times the length of the glabrous obconic calyces, which has broadly lanceolate acute entire deciduous lobes. The petals are white, nearly orbicular, and contracted below into short claws, and in drying turn a bright orange-color. The styles vary in number from three to five. The fruit, which matures and falls in the middle of August, is subglobose or occasionally somewhat pyriform, and from one third to one half of an inch in diameter, with a deep cavity and thin flesh, and is bright blue and covered with a glaucous bloom; the nutlets, which are a quarter of an inch long, pointed at the apex, rounded at the base, nearly triangular in section, and slightly two-grooved on the rounded and nearly smooth back, are composed almost entirely of the thick hard walls which inclose minute compressed seeds; these are not more than half a line thick and are covered with a pale brown testa.

Cratægus brachyacantha is distributed from the valley of Bayou Dorcheat in northwestern Louisiana through the western part of that state to the valley of the Sabine River in eastern Texas. It

grows on the borders of streams in rich moist soil, or surrounds with dense groves low wet prairies in western Louisiana, where, a few miles west of Opelousas, it is the most conspicuous and beautiful feature of the arborescent vegetation.

The wood of *Cratægus brachyacantha* is heavy, hard, and very close-grained, with a satiny surface susceptible of receiving a beautiful polish; it contains numerous very obscure medullary rays and is light brown tinged with rose, the thin sapwood, composed of ten or twelve layers of annual growth, being lighter colored. The specific gravity of the absolutely dry wood is 0.6793, a cubic foot weighing 42.33 pounds.

Cratægus brachyacantha was first collected, without flowers or fruit, by the Scotch botanist Thomas Drummond,[1] but its true character was only made known fifty years later, when it was rediscovered by Dr. Charles Mohr[2] near Minden in Louisiana in November, 1880.

Cratægus brachyacantha is the least widely distributed, and one of the largest and most beautiful representatives of the genus in North America. As it grows on the prairies of western Louisiana it is a striking and very attractive object, and its size, its compact well-shaped head, its lustrous foliage, its abundant flowers, and the color of its fruit, which is unlike that of any other Hawthorn, will make the Pomette Bleue, as it is called by the French Acadians of Louisiana, a valuable ornament of gardens and parks where the climate is sufficiently temperate for its full development.[3]

[1] See ii. 25.

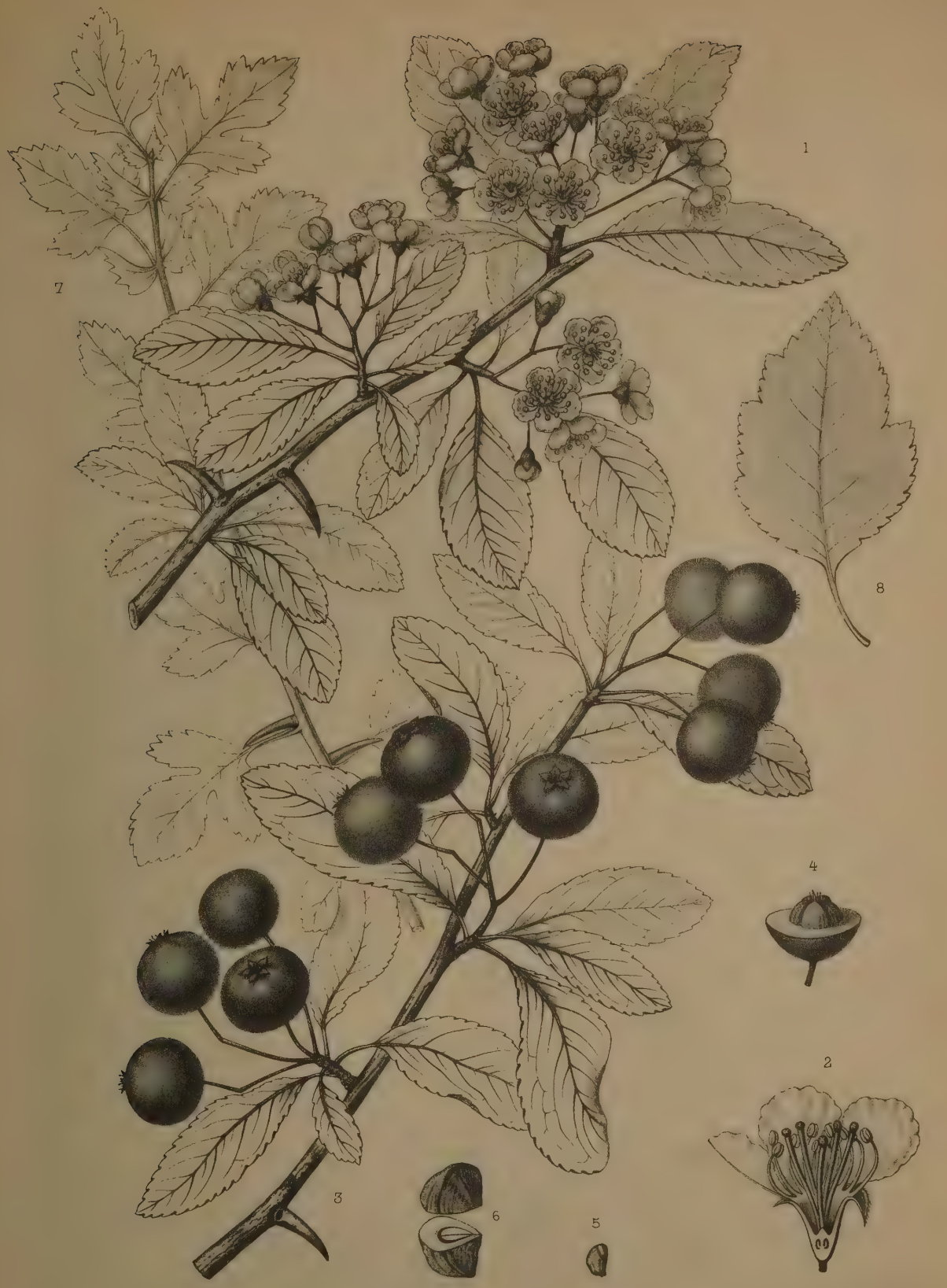
[2] Charles Mohr was born in Esslingen, Würtemberg, December 28, 1824, and early imbibed a taste for natural history and the woods from a relative employed in the forest service of Würtemberg, who made the boy his companion. In 1842 he entered the polytechnical school at Stuttgart, where he remained for three years, when, having made the acquaintance of the naturalist Kappler, an employee in the colonial service of Holland, he accompanied him as assistant to Dutch Guiana. Here, however, Mohr's stay was short, owing to repeated attacks of malarial fever; and, after the chemical works at Brunin in Moravia, where he next found employment, were closed in consequence of the political agitations of the year 1848, he sought a home in North America. The spring of 1849 found him crossing the plains to California, where he arrived on foot, after a journey of one hundred and seven days from the Missouri River. In California he made a collection of all the plants he could find in flower on the foothills of the Yuba valley and in the neighborhood of Sacramento. Unfortunately this collection, which doubtless contained a number of undescribed species, as Dr. Mohr was among the earliest botanists to explore central California, was lost during his return journey across the Isthmus of Panama. On reaching the east, Dr. Mohr first settled in Louisville, Kentucky, and, after a journey in Mexico, where he thought of establishing himself, and where he collected Mosses especially, and among them several new species afterwards described by Professor Karl Mueller of Halle, he made his home at Mobile, Alabama. Here for many years he has been a successful manufacturing druggist, and has devoted his spare time to the study of the flora and the natural resources of the state. Being appointed, in 1880, an agent of the Forestry Division of the 10th Census of the United States to investigate the forest resources of the Gulf states, he prosecuted this task during several years with great vigor and intelligence, traveling through all parts of the Gulf region west of the Appalachicola River, and obtaining the first accurate information about the composition and distribution of the southern forests, besides adding much to our knowledge of the range and life-histories of the trees which compose them. Later, as an agent for the American Museum of Natural History in New York, he again explored the southern forests to collect specimens for the Jesup Collection of North American Woods. He made a collection of southern woods under the auspices of the Louisville and Nashville Railroad Company for the New Orleans Exposition, and is now engaged, under the Forestry Division of the Department of Agriculture, in studying some of the most important timber-trees of the south. Dr. Mohr is the author of numerous papers upon the botany and geology of the southern states published in the reports of scientific societies or in more popular form. (See *Pharmaceutische Rundschau*, v. No. 2, 4.)

[3] Seeds of *Cratægus brachyacantha* were distributed by the Arnold Arboretum, in 1883, to the principal botanical establishments of Europe. In eastern Massachusetts the climate has proved too severe for it, and the young plants have all perished.

EXPLANATION OF THE PLATE.

PLATE CLXXVII. CRATÆGUS BRACHYACANTHA.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. A fruit with a part of the flesh removed, showing the nutlets, natural size.
5. A nutlet, natural size.
6. A nutlet divided transversely, enlarged.
7. A vigorous shoot with stipules, natural size.
8. A lobed leaf, natural size.



C E Faxon del. Picart fr. sc.

CRATÆGUS BRACHYACANTHA, Engelm. et Sarg.

A. Riocreux direx.t Imp. R. Taneur, Paris.

CRATÆGUS CRUS-GALLI.

Cockspur Thorn. Newcastle Thorn.

LEAVES subcoriaceous, obovate-cuneiform to broadly oval or linear-oblong.

Cratægus Crus-galli, Linnæus, *Spec.* 476. — Miller, *Dict.* ed. 8, No. 5. — Medicus, *Bot. Beob.* 1782, 344. — Moench, *Bäume Weiss.* 28. — Walter, *Fl. Car.* 147. — Willdenow, *Berl. Baumz.* 87; *Spec.* ii. pt. ii. 1004. — Michaux, *Fl. Bor.-Am.* i. 288. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 448. — Persoon, *Syn.* ii. 37. — Pursh, *Fl. Am. Sept.* i. 338. — Nuttall, *Gen.* i. 305. — Elliott, *Sk.* i. 548. — Bigelow, *Fl. Boston.* 118. — Watson, *Dendr. Brit.* i. 56, t. 56. — De Candolle, *Prodr.* ii. 626. — Hooker, *Fl. Bor.-Am.* i. 200. — Don, *Gen. Syst.* ii. 598. — Torrey & Gray, *Fl. N. Am.* i. 463. — Dietrich, *Syn.* iii. 158. — Torrey, *Fl. N. Y.* i. 221. — Roemer, *Fam. Nat. Syn.* iii. 117. — Darlington, *Fl. Cestr.* ed. 3, 83. — Chapman, *Fl.* 127. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 83. — Regel, *Act. Hort. Petrop.* i. 108. — Wenzig, *Linnæa*, xxxviii. 137. — Kaleniczenko, *Bull. Mosc.* xlviii. pt. ii. 19. — Emerson, *Trees Mass.* ed. 2, ii. 492, t. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 66. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 76. — Watson & Coulter, *Gray's Man.* ed. 6, 166. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 107 (*Man. Pl. W. Texas*).

Cratægus lucida, Miller, *Dict.* ed. 8, No. 6. — Moench, *Bäume Weiss.* 28. — Du Roi, *Obs. Bot.* 13. — Wangenheim, *Nordam. Holz.* 53, t. 17, f. 42. — Sprengel, *Syst.* ii. 506. — De Candolle, *Prodr.* ii. 629. — Don, *Gen. Syst.* ii. 599.

Mespilus Crus-galli, Marshall, *Arbust. Am.* 88. — Castiglioni, *Viag. negli Stati Uniti*, ii. 294. — Poiret, *Lam. Dict.* iv. 441. — Desfontaines, *Hist. Arb.* ii. 157. — *Nouveau Duhamel*, iv. 149. — Willdenow, *Enum.* 522; *Berl. Baumz.* ed. 2, 244. — Hayne, *Dendr. Fl.* 80. — Koch, *Dendr.* i. 142.

Mespilus lucida, Ehrhart, *Beitr.* iv. 17. — Moench, *Meth.* 685. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 448. — Spach, *Hist. Vég.* ii. 57.

Cratægus laurifolia, Medicus, *Gesch. Bot.* 84.

Mespilus cuneifolia, Moench, *Meth.* 684.

Cratægus Crus-galli, var. **splendens**, Aiton, *Hort. Kew.* ed. 2, iii. 202.

Mespilus Watsoniana, Spach, *Hist. Vég.* ii. 57.

Cratægus Watsoniana, Roemer, *Fam. Nat. Syn.* iii. 117.

Cratægus Carrierei, Carrière, *Rev. Hort.* 1883, 108, t.

Cratægus Lavallei, Hort. Paris.

A tree, twenty to thirty feet in height, with a trunk four to six feet tall and sometimes a foot in diameter, covered, like the stout rigid spreading branches which form a broad flat or round head, with light red-brown or ashy gray scaly bark, and usually armed with long stout often branched spines. The branchlets are glabrous, and at first green but soon become light brown or gray tinged with brown, or sometimes, in the southern states, bright red and lustrous; they are stout, usually more or less zigzag, light brown to ashy gray in their second year, and armed with stout straight or slightly curved sharp-pointed chestnut-brown or ashy gray spines from one to four inches in length, which continue to enlarge for many years and eventually often become many branched and six or eight inches long. The winter-buds are obtuse, an eighth of an inch long, and covered by chestnut-brown lustrous apiculate scales rounded on the back and scarious on the margins, those of the inner ranks being at maturity lanceolate, acute, finely glandular-serrate, from one half of an inch to an inch in length, sometimes bright red and caducous. The leaves are obovate, cuneiform to broadly ovate or linear-oblong, acute or rounded at the apex, gradually contracted below into short broad petioles, sharply serrate except towards the base with minute appressed usually glandular-tipped teeth, and rarely slightly three-lobed; they are glabrous or occasionally puberulous on the lower surface, thick and coriaceous, dark green and lustrous above, and pale below, reticulate-veined, with narrow midribs and primary veins, an inch to five inches long, and from one quarter of an inch to an inch and a half wide. The stipules are linear-acute to ligulate, minutely glandular-serrate, from one quarter to one half of an inch in length, and caducous; or, on vigorous shoots, they are foliaceous, obliquely ovate, stalked, coarsely glandular-serrate, and sometimes half an inch broad. In the autumn before falling the leaves turn bright orange and scarlet. The flowers, which appear after the leaves are fully grown from the middle of April in Texas to the middle of June

in New England, are produced in many-flowered glabrous or sometimes puberulous thin-branched elongated racemose corymbs, the lower branches from the axils of leaves. The bracts and bractlets are linear-spatulate, acute, finely glandular-serrate, half an inch to an inch in length, usually tinged with red, and caducous. The flowers are two thirds of an inch across and are borne on slender pedicels one half of an inch to nearly an inch in length; the calyx is narrow, obconic, and glabrous or pilose on the outer surface, with linear-lanceolate entire or minutely glandular-serrate persistent lobes rather shorter than the white petals; the pistils are two to five and are surrounded at the base by tufts of pale hairs. The fruit is subglobose or rarely pyriform, and one third of an inch across, with a deep cavity surrounded by the remnants of the calyx-lobes and filaments, and is dull red with thin dry mealy flesh. The nutlets are a quarter of an inch long, rounded at both ends, and two or three-grooved on the back, with broad rounded ridges and thick brittle walls. The seed is acute, one sixteenth of an inch in length, and covered with a thin papery light brown testa.[1]

Cratægus Crus-galli is distributed from the valley of the St. Lawrence to the northern shores of Lake Erie,[2] ranging southward in the United States to the valley of the Chipola River in western Florida, and westward to Missouri and to the valley of the Colorado River in Texas. It grows in rich soil, usually along the margins of swamps, on the borders of prairies, or in the neighborhood of streams; it is generally distributed but nowhere very common in the northern and eastern states, and is abundant and attains its largest size in southern Arkansas, Louisiana, and Texas.

The wood of *Cratægus Crus-galli* is heavy, hard, and close-grained, with a satiny surface, and contains many obscure medullary rays. It is brown tinged with red, with thin lighter colored sapwood. The specific gravity of the absolutely dry wood is 0.7194, a cubic foot weighing 44.83 pounds.

[1] The leaves of *Cratægus Crus-galli*, although easily recognized by their texture and lustrous upper surface, vary considerably in form on different individuals and sometimes on the same individual. Botanists have endeavored to establish varieties based on some of these different leaf-forms, although such characters have little value in Cratægus and are not at all constant or to be depended upon. These varieties are: —

Var. *pyracanthifolia*, Aiton, *Hort. Kew.* ii. 170. — De Candolle, *Prodr.* ii. 626. — Torrey & Gray, *Fl. N. Am.* i. 464. — Loudon, *Arb. Brit.* ii. 820, t. 128, f. 580. — Regel, *Act. Hort. Petrop.* i. 109 (in part). — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 76.

Cratægus salicifolia, Medicus, *Bot. Beob.* 1782, 345. — Roemer, *Fam. Nat. Syn.* iii. 117.

Cratægus Crus-galli, var. *salicifolia*, Aiton, *Hort. Kew.* ii. 170. — De Candolle, *Prodr.* ii. 626. — Loudon, *Arb. Brit.* ii. 820, f. 551–553, 578, t. — Regel, *Act. Hort. Petrop.* i. 110. — Wenzig, *Linnæa*, xxxviii. 139.

Mespilus Crus-galli, var. *salicifolia*, Hayne, *Dendr. Fl.* 80. — Willdenow, *Berl. Baumz.* ed. 2, 244.

Mespilus Crus-galli, var. *pyracanthifolia*, Hayne, *Dendr. Fl.* 80.

Mespilus salicifolia, Koch, *Dendr.* i. 144.

Cratægus Coursetiana, Roemer, *Fam. Nat. Syn.* iii. 117.

Var. *ovalifolia*, *Bot. Reg.* t. 1860. — Torrey & Gray, *Fl. N. Am.* i. 464. — Dietrich, *Syn.* iii. 159. — Loudon, *Arb. Brit.* ii. 821, f. 579, t. — Regel, *Act. Hort. Petrop.* i. 109. — Wenzig, *Linnæa*, xxxviii. 139. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 76.

Mespilus ovalifolia, Hornemann, *Hort. Hafn.* Suppl. 52. — Koch, *Dendr.* i. 143.

Mespilus prunellifolia, Poiret, *Lam. Dict.* Suppl. iv. 72.

Cratægus ovalifolia, De Candolle, *Prodr.* ii. 627. — Don, *Gen. Syst.* ii. 598. — Roemer, *Fam. Nat. Syn.* iii. 117. — Sargent, *Forest Trees N. Am.* 10th *Census U. S.* ix. 76.

Cratægus prunellifolia, De Candolle, *Prodr.* ii. 627. — Don, *Gen. Syst.* ii. 598. — Roemer, *Fam. Nat. Syn.* iii. 117.

Mespilus elliptica, Guimpel, Otto & Hayne, *Abbild. Holz.* 170, t. 144 (not Lamarck). — Spach, *Hist. Vég.* ii. 68.

Var. *linearis*, De Candolle, *Prodr.* ii. 626. — Torrey & Gray, *Fl. N. Am.* i. 464. — Dietrich, *Syn.* iii. 159. — Loudon, *Arb. Brit.* ii. 821, f. 577. — Regel, *Act. Hort. Petrop.* i. 110. — Wenzig, *Linnæa*, xxxviii. 140. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 76.

Mespilus lucida, var. *angustifolia*, Ehrhart, *Beitr.* iv. 18.

Cratægus linearis, Persoon, *Syn.* ii. 37. — Roemer, *Fam. Nat. Syn.* iii. 118.

Mespilus linearis, Desfontaines, *Hist. Arb.* ii. 156. — Poiret, *Lam. Dict.* Suppl. iv. 70. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 448. — Spach, *Hist. Vég.* ii. 57.

This is the most distinct of all the forms of *Cratægus Crus-galli*. It is not known to me in a wild state, and is believed to have originated in Europe, probably in France, where it appears to be more often cultivated than the other forms of the species.

Var. *prunifolia*, Torrey & Gray, *Fl. N. Am.* i. 464. — Dietrich, *Syn.* iii. 159. — Loudon, *Arb. Brit.* ii. 821, f. 576, t. — Regel, *Act. Hort. Petrop.* i. 110. — Wenzig, *Linnæa*, xxxviii. 140. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 77.

Mespilus prunifolia? Marshall, *Arbust. Am.* 90. — Poiret, *Lam. Dict.* iv. 443. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 448. — *Nouveau Duhamel*, iv. 150, t. 40. — Sprengel, *Syst.* ii. 506.

Cratægus prunifolia, Persoon, *Syn.* ii. 37. — De Candolle, *Prodr.* ii. 627. — Don, *Gen. Syst.* ii. 598. — *Bot. Reg.* t. 1868.

Var. *Fontanesiana*, Wenzig, *Linnæa*, xxxviii. 141.

Mespilus Fontanesiana, Spach, *Hist. Vég.* ii. 58, t. 10, f. K.

Mespilus Bosciana, Spach, *Hist. Vég.* ii. 58.

Cratægus badiata, Bosc, *Nouv. Cours d'Agric.* ii. 224, 11, 58.

Cratægus Bosciana, Roemer, *Fam. Nat. Syn.* iii. 118.

[2] Brunet, *Cat. Vég. Lig. Can.* 26. — Macoun, *Cat. Can. Pl.* i. 147.

In some parts of the country the spurs are used as pins to close the mouths of sacks and for similar purposes.

Cratægus Crus-galli was introduced into English gardens toward the end of the seventeenth century,[1] and the first description and portrait of this tree are those of Plukenet, made from cultivated plants and published in 1691 in his *Phytographia*.[2]

In western Louisiana, and eastern Texas and occasionally in the southern Atlantic states, a variety, *Cratægus Crus-galli*, var. *berberifolia*,[3] occurs with obovate leaves rounded at the apex and covered, as are the shoots, the corymbs, and the calyces, by thick pale persistent pubescence, and with orange-colored red-cheeked fruit. In its habit, however, in the appearance of its bark, the form and texture of its leaves, the character of its thorns, or the nature of its wood, this tree is not distinguishable from the ordinary form of the Cockspur Thorn which grows with it.

The specific gravity of the absolutely dry wood of *Cratægus Crus-galli*, var. *berberifolia*, is 0.6126, a cubic foot weighing 38.17 pounds.[4]

It was discovered many years ago near Opelousas[5] in Louisiana, by Professor William M. Carpenter.[6]

Cratægus Crus-galli has been more generally cultivated in the United States and in Europe than any other American Hawthorn, and as a cultivated plant it is particularly beautiful. It flowers later than most trees, and after its large and beautifully lustrous leaves are fully developed. Its habit is always good and often striking; its foliage is less subject to fungal diseases than that of the other American species; and its fruit, which birds do not devour, covers the branches until the spring without losing color. It is the best of the American Hawthorns to plant in hedges,[7] and for more than a century has been used in some parts of the eastern states for this purpose.[8]

[1] Aiton, *Hort. Kew.* ii. 170. — Loudon, *Arb. Brit.* ii. 820, f. 574, 575, t.

[2] *Mespilus aculeata Pyrifolia denticulata splendens, fructu insigni rutilo Virginiensis*, t. 46, f. 1; *Alm. Bot.* 249. — Miller, *Dict.* No. 9.

Mespilus; spinosa, sive Oxyacantha Virginiana. The Cockspur or Virginian Hawthorn, Miller, *Dict.* No. 8.

Mespilus foliis lanceolatis serratis, spinis robustioribus, floribus corymbosis, Miller, *Dict. Icon.* 119, t. 178, f. 2.

[3] Sargent, *Garden and Forest*, ii. 464.

Cratægus berberifolia, Torrey & Gray, *Fl. N. Am.* i. 469. — Dietrich, *Syn.* iii. 159. — Walpers, *Rep.* ii. 59. — Roemer, *Fam. Nat. Syn.* iii. 115. — Regel, *Act. Hort. Petrop.* i. 123. — Engelmann, *Bot. Gazette*, vii. 128. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 82.

Mespilus berberifolia, Wenzig, *Linnæa*, xxxviii. 125.

[4] *Garden and Forest*, iii. 344.

[5] This tree is common four miles west of Opelousas, Louisiana, on land adjoining the plantation of Monsieur Pierre Pompon Petre, in an open grove of Oaks and Hickories, growing on low moist ground with the Hornbeam, the Flowering Dogwood, and the Parsley Haw, close to the border of a prairie surrounded by broad masses of *Cratægus brachyacantha*.

[6] William M. Carpenter (1811–1848) was born in St. Francisville in the parish of West Feliciana, Louisiana. In 1829 he entered the military academy at West Point, but two years later delicate health compelled him to resign, and he left the academy before graduation and began the study of medicine in the Louisiana Medical College, from which he was graduated in 1836, when he was called to the chair of natural history and chemistry in the Louisiana State College at Jackson in his native parish. In the six years during which Professor Carpenter was connected with this institution he devoted himself assiduously to studying the flora of Louisiana, communicating the results of his observations to the authors of the *Flora of North America*. In 1842 he was made professor of materia medica and therapeutics in the Louisiana State College, a position which he held until his death, six years later. *Carpenteria*, a genus with a single species, a lovely white-flowered shrub of the California Sierras, was dedicated to his memory by his friend Torrey.

[7] "The *Virginian Azarole* with a red fruit, or *Linnæus's Cratægus Crus-galli*, is a species of hawthorn, and they plant it in hedges, for want of that hawthorn, which is commonly used for this purpose in *Europe*. Its berries are red, and of the same size, shape, and taste with those of our hawthorn. Yet this tree does not seem to make a good hedge, for its leaves were already fallen, whilst other trees still preserved theirs." (Kalm, *Travels*, English ed. i. 115.)

[8] The name of Newcastle Thorn, sometimes given to this species, had its origin in the fact that it was once largely used as a hedge plant by the farmers of Newcastle County, Delaware.

EXPLANATION OF THE PLATES.

Plate CLXXVIII. Cratægus Crus-galli.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. A fruit with a part of the flesh removed, showing the nutlets, natural size.
5. View of the back of a nutlet, natural size.
6. A nutlet divided transversely, enlarged.
7. Winter-buds, natural size.
8. A leaf from a vigorous shoot with stipules, natural size.
9. A leaf of the linear-lanceolate form, natural size.

Plate CLXXIX. Cratægus Crus-galli, *var.* berberifolia.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. Cross section of a fruit, natural size.
5. A nutlet, natural size.
6. A nutlet divided transversely, enlarged.

C.E. Faxon del.

Picart sc.

CRATÆGUS CRUS-GALLI, L.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

C. E. Faxon del. Guesnier sc.

CRATÆGUS CRUS-GALLI, Var. BERBERIFOLIA, Sarg.

A. Riocreux direx.t Imp. R. Taneur, Paris.

CRATÆGUS COCCINEA.

Scarlet Haw. White Thorn.

LEAVES membranaceous, round-ovate, acutely incised.

Cratægus coccinea, Linnæus, *Spec.* 476. — Miller, *Dict.* ed. 8, No. 4. — Du Roi, *Harbk. Baumz.* i. 193. — Moench, *Bäume Weiss.* 28. — Walter, *Fl. Car.* 147. — Willdenow, *Berl. Baumz.* 81; *Spec.* ii. pt. ii. 1000 (excl. syn.). — Michaux, *Fl. Bor.-Am.* i. 288. — Persoon, *Syn.* ii. 36. — Pursh, *Fl. Am. Sept.* i. 337. — Nuttall, *Gen.* i. 305. — Schrank, *Pfl. Lab.* 26. — Elliott, *Sk.* i. 553. — Torrey, *Fl. N. Y.* i. 221. — De Candolle, *Prodr.* ii. 627. — Hooker, *Fl. Bor.-Am.* i. 201; *Bot. Mag.* t. 3432. — Don, *Gen. Syst.* ii. 599. — *Bot. Reg.* t. 1957. — Torrey & Gray, *Fl. N. Am.* i. 465. — Bigelow, *Fl. Boston.* ed. 3, 206. — Dietrich, *Syn.* iii. 160. — Walpers, *Rep.* ii. 58. — Schnizlein, *Icon.* t. 270, f. 18–20, 22. — Darlington, *Fl. Cestr.* ed. 3, 83. — Chapman, *Fl.* 127. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 82. — Kaleniczenko, *Bull. Mosc.* xlviii. pt. ii. 9. — Emerson, *Trees Mass.* ed. 2, ii. 493, t. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 66. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 77. — Watson & Coulter, *Gray's Man.* ed. 6, 165.

Mespilus coccinea, Marshall, *Arbust. Am.* 87. — Castiglioni, *Viag. negli Stati Uniti*, ii. 293. — Moench, *Meth.* 684. — Poiret, *Lam. Dict.* iv. 442. — Desfontaines, *Hist. Arb.* ii. 156. — Willdenow, *Enum.* 523; *Berl. Baumz.* ed. 2, 238. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 451. — Hayne, *Dendr. Fl.* 77. — Wendland, *Regensb. Flora*, 1823, 699. — Sprengel, *Syst.* ii. 507. — Spach, *Hist. Vég.* ii. 64.

Cratægus rotundifolia, Moench, *Bäume Weiss.* 29, t. 1.

Mespilus rotundifolia, Ehrhart, *Beitr.* iii. 20. — Wendland, *Regensb. Flora*, 1823, 700. — Koch, *Dendr.* i. 148.

Mespilus coccinea, var. **viridis**, Castiglioni, *Viag. negli Stati Uniti*, ii. 293.

? Mespilus maxima, Du Mont de Courset, *Bot. Cult.* ed. 2, v. 451.

? Cratægus viridis, Elliott, *Sk.* i. 551 (not Linnæus). — Darlington, *Fl. Cestr.* ed. 2, 293.

Mespilus odorata, Wendland, *Regensb. Flora*, 1823, 700.

? Mespilus Wendlandii, Opiz, *Regensb. Flora*, 1834, 590.

Mespilus flabellata, Spach, *Hist. Vég.* ii. 63. — Koch, *Dendr.* i. 148.

Cratægus coccinea, var. **oligandra**, Torrey & Gray, *Fl. N. Am.* i. 465. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 78.

Cratægus coccinea, var. **viridis**, Torrey & Gray, *Fl. N. Am.* i. 465. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 78.

Halmia flabellata, Roemer, *Fam. Nat. Syn.* iii. 136.

Anthomeles rotundifolia, Roemer, *Fam. Nat. Syn.* iii. 140.

Phænopyrum coccineum, Roemer, *Fam. Nat. Syn.* iii. 156.

Phænopyrum Wendlandii, Roemer, *Fam. Nat. Syn.* iii. 156.

Cratægus glandulosa, var. **rotundifolia**, Regel, *Act. Hort. Petrop.* i. 120.

A bushy intricately branched tree, rarely twenty feet in height, with a short trunk sometimes a foot in diameter, and stout spreading branches which form a narrow head; or more often a tall or low shrub. The bark of the trunk is light brown or ashy gray and is slightly fissured, the surface being broken into small persistent plate-like scales. The branchlets, which are at first light green and glabrous or pubescent, in their first winter are usually zigzag, bright red and lustrous or sometimes light brown or gray, and marked by many small pale lenticels, and in their second year become light brown or ashy gray, their bark ultimately separating, like that of the trunk, into persistent scales; they are armed with slender straight or slightly curved chestnut-brown or sometimes gray persistent spines an inch to two inches in length. The winter-buds are nearly globular, one sixteenth of an inch across, and covered with bright chestnut-brown scales, scarious on the margins and rounded on the back; at maturity the scales of the inner rows are from half an inch to an inch in length and are lanceolate, ligulate, or broadly obovate, glandular-serrate, and usually more or less tinged with red. The leaves are round-ovate, acute, wedge-shaped, rounded, truncate, or, on vigorous shoots, often subcordate at the base, acutely incised, or slightly five to nine-lobed, and sharply and irregularly serrate except at the base with acute glandular teeth; they are very thin and membranaceous, at first glabrous or puberulous on the upper, and pubescent on the lower surface, and glabrous at maturity or sometimes puberulous below, and are borne

on slender glabrous or pubescent petioles often an inch to an inch and a quarter long, and vary from an inch to four inches in length and from an inch to two and a half inches in breadth. The stipules are glandular-serrate, caducous, linear, acute, or, on vigorous shoots, foliaceous, broadly ovate, and stalked. The flowers, which appear when the leaves are nearly fully grown, are produced in few-flowered elongated glabrous or pubescent corymbs with lanceolate or narrowly oblong acute glandular-serrate caducous bracts and bractlets; they are borne on slender pedicels, and vary from half an inch to nearly an inch in diameter. The calyx is obconic, and glabrous or puberulous, with long lanceolate denticulate or rarely entire and usually glandular lobes much shorter than the obovate white petals, which are erose or occasionally denticulate towards the base. There are two to five pistils surrounded at the base by tufts of pale hairs. The fruit, which ripens in September and October and generally hangs on the branches until after the leaves have fallen, is subglobose or slightly elongated or pyriform, bright scarlet, and one third to one half of an inch in diameter, with a shallow cavity surrounded by the persistent calyx-lobes and remnants of the filaments, and thin dry flesh; the nutlets are acute at both ends, with two deep grooves and a prominent ridge on the back, and thick hard walls. The seed is acute, and is covered by a pale brown coat.

Cratægus coccinea is distributed from the western shores of Newfoundland through the maritime provinces of Canada, Quebec, and Ontario, and extends westward through Winnipeg nearly to the eastern base of the Rocky Mountains.[1] In the United States it ranges southward to northern Florida and eastern Texas and westward to Nebraska and Kansas. It grows in dense thickets, in open upland woods, or rocky pastures, or in lower ground near the borders of streams and prairies, and is common in all the northern states, on the Alleghany Mountains, and in the valley of the Ohio River, but comparatively rare in the south.

The wood of *Cratægus coccinea* is heavy, hard, and close-grained, with thin obscure medullary rays; it is brown tinged with red, with thin lighter colored sapwood. The specific gravity of the absolutely dry wood is 0.8618, a cubic foot weighing 53.71 pounds.

A distinct form of the Scarlet Thorn, *Cratægus coccinea*, var. *macracantha*,[2] may be distinguished by the longer bright chestnut-brown thorns, two to five inches long, which cover its straggling branches, and by the broadly obovate leaves; these are acute at the apex, wedge-shaped, and contracted below into broad stout petioles, sharply and often doubly serrate with acute glandular-tipped teeth except at the base, sometimes three-lobed, coriaceous, dark green and glabrous on the upper, and paler on the lower surface, with a few pale hairs along the prominent midribs and primary veins, three or four inches long, and two to two and a half inches broad. The flowers are smaller than those of the more common *Cratægus coccinea*, with narrow pectinately glandular calyx-lobes, and are produced in broader looser pilose or pubescent corymbs. The fruit is oblong, or subglobose, smaller and less fleshy, with larger nutlets.

[1] Meyer, *Pl. Lab.* 82. — Macoun, *Cat. Can. Pl.* i. 147.

[2] Dudley, *Bull. Cornell Univ.* ii. 33 (*Cayuga Flora*). — Sargent, *Garden and Forest*, ii. 412. — Watson & Coulter, *Gray's Man.* ed. 6, 165.

? Cratægus glandulosa, Moench, *Bäume Weiss.* 31.

? Pyrus glandulosa, Moench, *Meth.* 680.

Cratægus glandulosa, Willdenow, *Berl. Baumz.* 84 (not Aiton); *Spec.* ii. 1002 (excl. syn.). — Pursh, *Fl. Am. Sept.* i. 337 (in part). — De Candolle, *Prodr.* ii. 627. — Loddiges, *Bot. Cab.* t. 1012. — Hooker, *Fl. Bor.-Am.* i. 201. — Don, *Gen. Syst.* ii. 599. — Loudon, *Arb. Brit.* ii. 817, f. 550, 567, 568, t. — Regel, *Act. Hort. Petrop.* i. 120.

Mespilus sanguinea, Du Mont de Courset, *Bot. Cult.* ed. 2, v. 452 (excl. syn.).

Mespilus glandulosa, Willdenow, *Enum.* 523. — Sprengel, *Syst.* ii. 507. — Watson, *Dendr. Brit.* i. 58, t. 58. — Schmidt, *Oestr. Baumz.* iv. 33, t. 213. — Spach, *Hist. Vég.* ii. 62. — Koch, *Dendr.* i. 145.

Cratægus macracantha, Loddiges; Loudon, *Arb. Brit.* ii. 819, f. 572, 573, t.

Cratægus glandulosa, var. *macracantha*, Lindley, *Bot. Reg.* t. 1912.

Cratægus sanguinea, Torrey & Gray, *Fl. N. Am.* i. 464 (excl. var. β.; not Pallas).

Cratægus coccinea, var. *viridis*, Torrey, *Pacific R. R. Rep.* iv. 86 (not Torrey & Gray).

Cratægus coccinea, T. S. Brandegee, *Rep. Chief Engineer U. S. A.* Appx. S. 1841 (not Linnæus); *Bull. U. S. Geolog. & Geog. Surv. Terr.* ii. 236 (*Fl. Southwest Colorado*). — Coulter, *Man. Rocky Mt. Bot.* 90.

Cratægus Douglasii, Macoun, *Cat. Can. Pl.* i. 522 (not Lindley).

Cratægus coccinea, var. *macracantha*, is common in eastern Massachusetts, where it grows with *Cratægus coccinea;* it occurs on the Maine coast, in northern New Hampshire and Vermont, and in the province of Quebec, and ranges westward through Winnipeg. It occurs in Missouri and is not rare on the Rocky Mountains of southwestern Colorado and of New Mexico, in eastern Oregon, and on the eastern slopes of the Cascade Mountains in Washington.[1]

A shrubby form of the southern states with small thin glabrous deltoid-ovate leaves, usually wedge-shaped or sometimes cordate at the base, and borne on slender petioles, is distinguished as *Cratægus coccinea*, var. *populifolia*.[2] It produces small flowers in narrow few-flowered corymbs, and small fruit.

Cratægus coccinea was probably introduced into English gardens in the seventeenth century, and the earliest descriptions of it were drawn up from cultivated plants.[3]

In cultivation it is a less desirable plant than the related *Cratægus mollis*, and than several other North American species, and it is now rarely found in gardens.

[1] The synonymy of this variety, which is possibly the *Cratægus glandulosa* of Moench, is much involved. If it is the *Cratægus glandulosa* of this author, and is regarded as a variety of *Cratægus coccinea*, its name would be var. *glandulosa*. But the identity of Moench's plant is so doubtful that it is better to pass over this name and take up the much later one of Loddiges and Loudon, although it is in part the *Cratægus glandulosa* of Willdenow, whose name, however, was published later than the *Cratægus glandulosa* of Aiton, which is the *Cratægus flava* of this author. The figure in Watson's *Dendrologia Britannica* was made from this variety, which is admirably portrayed by Schmidt.

[2] Torrey & Gray, *Fl. N. Am.* i. 465. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 78.

Cratægus populifolia, Elliott, *Sk.* i. 553 (not Walter). — Nuttall, *Gen.* i. 305.

Mespilus populifolia, Poiret, *Lam. Dict.* iv. 447.

Phœnopyrum populifolium, Roemer, *Fam. Nat. Syn.* iii. 153.

Cratægus coccinea, var. *typica*, Regel, *Act. Hort. Petrop.* i. 121.

[3] The confusion in the pre-Linnæan descriptions of the American Hawthorns makes it impossible in some cases to determine which species different authors intended to describe; but it is apparent that some of the descriptions which have usually been thought to refer to *Cratægus coccinea* relate rather to *Cratægus mollis*, which was well figured by Plukenet.

? *Mespilus Virginiana grossulariæ foliis, fructu rubro minore, Alm. Bot.* 249 (excl. syn. Banister).

Cratægus foliis ovatis repando-angulatis serratis, Linnæus, *Hort. Cliff.* 187; *Hort. Ups.* 126. — Clayton, *Fl. Virgin.* 54. — Royen, *Fl. Leyd. Prodr.* 272.

EXPLANATION OF THE PLATES.

PLATE CLXXX. CRATÆGUS COCCINEA.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. A fruit with part of the flesh removed, showing the nutlets, natural size.
5. View of the side of a nutlet, natural size.
6. A nutlet divided transversely, enlarged.
7. The end of a vigorous leafy shoot with stipules, natural size.
8. A winter branchlet, natural size.

PLATE CLXXXI. CRATÆGUS COCCINEA, *var.* MACRACANTHA.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. Cross section of a fruit, enlarged.
5. A nutlet, natural size.
6. A nutlet divided transversely, enlarged.
7. Portion of a young branchlet with stipules, natural size.

C. E. Faxon del. Himely sc.

CRATÆGUS COCCINEA, L.

A. Riocreux direx.t Imp. R. Taneur, Paris.

C. E. Faxon del. Toulet sc.

CRATÆGUS COCCINEA, Var. MACRACANTHA, Dudley.

A. Riocreux dirext. Imp. Tancur, Paris.

CRATÆGUS MOLLIS.

Scarlet Haw.

LEAVES membranaceous, broadly ovate, usually incisely lobed, pubescent on the lower surface.

Cratægus mollis, Scheele, *Linnæa*, xxi. 569; *Roemer Texas*, Appx. 473. —Walpers, *Ann.* ii. 523.

Mespilus coccinea, Schmidt, *Oestr. Baumz.* iv. 30, t. 210 (not Linnæus).

Mespilus pubescens, Wendland, *Regensb. Flora*, 1823, 700 (not Humboldt & Bonpland).

Mespilus coccinea, β. **pubescens**, Tausch, *Regensb. Flora*, 1838, pt. ii. 718.

Cratægus coccinea, var. **mollis**, Torrey & Gray, *Fl. N. Am.* i. 465. — Gray, *Jour. Bost. Soc. Nat. Hist.* vi. 186 (*Pl. Lindheim.* ii.). — Regel, *Act. Hort. Petrop.* i. 121. — Wenzig, *Linnæa*, xxxviii. 132. —Watson & Coulter, *Gray's Man.* ed. 6, 165. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 107 (*Man. Pl. W. Texas*).

Cratægus tomentosa, Emerson, *Trees Mass.* 435; ed. 2, ii. 494, t. (not Linnæus). — Provancher, *Flore Canadienne*, 212.

Phænopyrum subvillosum, Roemer, *Fam. Nat. Syn.* iii. 154.

Cratægus subvillosa, Torrey, *Pacific R. R. Rep.* iv. 86. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 66. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 78. — Havard, *Proc. U. S. Nat. Mus.* viii. 512.

Cratægus Texana, Buckley, *Proc. Phil. Acad.* 1861, 454.

Cratægus tomentosa, var. **mollis**, Gray, *Man.* ed. 5, 160.

Mespilus tiliæfolia, Koch, *Dendr.* i. 151.

A tree, twenty to thirty feet in height, with a straight trunk twelve to eighteen inches in diameter, and spreading often contorted branches which form a compact round head. The bark of the trunk is one third of an inch thick, slightly furrowed, and ashy gray to reddish brown, the surface being broken into small persistent plate-like scales. The branchlets are coated when young with thick pale tomentum, and in their first winter are light orange-brown, lustrous, and marked by pale lenticels, becoming darker in their second year and eventually ashy gray; they are stout, zigzag, and armed with thick and straight spines which are chestnut-brown and lustrous or finally ashy gray and two or three inches in length. The winter-buds are obtuse, one eighth of an inch long, and protected by orbicular chestnut-brown lustrous scales ciliate on the margins and rounded on the back; the scales of the inner rows at maturity are obovate, rounded or truncate at the apex, glandular-serrate, and from half an inch to an inch in length. The leaves are broadly ovate, acute at the apex, cuneate, truncate, or cordate at the base, sharply serrate with slender spreading glandular-tipped teeth, and often incisely many-lobed; when they unfold they are coated on the lower surface with pale tomentum, and are more or less pubescent on the upper surface; and at maturity they are thin and membranaceous, pubescent or tomentose below, glabrous or slightly scabrous above, light green, with broad prominent midribs and primary veins deeply grooved on the upper side, three to five inches long, and three to four inches broad, and borne on stout pubescent petioles an inch to two inches in length. The stipules are glandular-serrate, deciduous, foliaceous, acute, or lunate, and sometimes an inch broad on vigorous shoots. The flowers, which are from an inch to an inch and a quarter across when expanded, are produced in broad pubescent or tomentose stout-branched corymbs, with large spatulate glandular-serrate deciduous or occasionally persistent bracts and bractlets, and appear several days earlier than those of *Cratægus coccinea*, when the leaves are half grown, which in Texas is in March and in New England from the middle to the end of May. The calyx is obconic, coated with tomentum or pubescence, and lined with a bright red or green disk; the lobes are acute, glandular-serrate, and persistent. The ovaries are pubescent or puberulous, and are surrounded at the base with tufts of pale hairs. The fruit, which ripens and falls in September or early in October, is subglobose or pyriform, with a shallow cavity surrounded by the remnants of the

calyx-lobes and filaments; it is often pubescent while young, and at maturity is an inch to an inch and a quarter in diameter, bright orange-scarlet, and covered with a glaucous bloom; the flesh is thin and mealy but sweet and edible; the nutlets are pointed at both ends, lunate, rounded on the back, with a single broad deep or sometimes shallow groove down the middle, thin brittle walls, and a large seed covered with a pale brown coat.

Cratægus mollis is distributed from the shores of Massachusetts Bay to northern New England and the province of Quebec,[1] and ranges westward through central Michigan to Missouri and middle Tennessee, and through Arkansas to the valley of the San Antonio River in Texas, reappearing on the Sierra Madre near Saltillo in Mexico. It grows on the margins of swamps, along the banks of streams, and on prairies in rich soil; in New England it is more tree-like in habit and attains a larger size than the other native Hawthorns, and reaches its best development in Texas and southern Arkansas, where it abounds.

The wood of *Cratægus mollis* is heavy, hard, and close-grained, although not strong; it is light brown or red, with thick sapwood composed of twenty-five or thirty layers of annual growth, and contains numerous very obscure medullary rays. The specific gravity of the absolutely dry wood is 0.7953, a cubic foot weighing 49.56 pounds.

Cratægus mollis, although it was long confounded with *Cratægus coccinea*, was introduced into European gardens and was described and figured before the end of the seventeenth century,[2] and it is no doubt this species which is called the White Thorn in early accounts of New England.[3]

It is the largest and handsomest of the Scarlet Hawthorns of North America, and its rapid growth, tree-like habit, ample foliage, and large and abundant flowers, as well as its brilliant fruit which, however, has the disadvantage of falling as soon as it ripens, commend it to the attention of planters.

[1] Brunet, *Cat. Vég. Lig. Can.* 25. — Macoun, *Cat. Can. Pl.* i. 147.

[2] *Mespilus Apii folio Virginiana spinis horrida, fructu amplo coccineo*, Plukenet, *Phyt.* t. 46, f. 4; *Alm. Bot.* 249.

Mespilus spinosa, sive Oxyacantha maxima Virginiana, Hermann, *Cat. Lugd. Bat.* 423. — Boerhaave, *Cat. Lugd. Bat.* ii. 257. — *Cat. Pl. Lond.* p. 49.

Mespilus aculeata pyrifolia denticulata splendens fructu insigni rutilo Virginiensis, *Cat. Pl. Lond.* t. 13, f. 2 (not Plukenet).

Mespilus Canadensis, Sorbi torminalis facie, Tournefort, *Inst.* 642. — Duhamel, *Traité des Arbres*, ii. 16.

[3] "Also, mulberries, plums, raspberries, corrance, chestnuts, filberds, walnuts, smalnuts, hurtleberies, and hawes of whitethorne neere as good as our cherries in England, they grow in plentie here." (Higginson, *New England's Plantation* [*Coll. Mass. Hist. Soc.* i. 119].)

"The whitethorne affords haws as bigge as an English Cherrie, which is esteemed above a Cherrie for his goodnesse and pleasantnesse to the taste." (Wood, *New England's Prospect*, pt. i. chap. 5, 20.)

EXPLANATION OF THE PLATE.

PLATE CLXXXII. CRATÆGUS MOLLIS.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. A subglobose fruit, natural size.
5. A fruit, part of the flesh removed, showing nutlets, enlarged.
6. A nutlet, natural size.
7. A nutlet divided transversely, enlarged.
8. A stipule of a young branchlet, natural size.
9. A winter branchlet, natural size.

C.E. Faxon del. Picart sc.

CRATÆGUS MOLLIS., Scheele.

A. Riocreux direx.t Imp. R. Taneur, Paris.

CRATÆGUS TOMENTOSA.

Haw.

LEAVES ovate to ovate-oblong, contracted into margined petioles, densely coated with pubescence on the lower surface.

Cratægus tomentosa, Linnæus, *Spec.* 476 (excl. syn. Clayton). — Miller, *Dict.* ed. 8, No. 9. — Du Roi, *Harbk. Baumz.* i. 183. — Torrey & Gray, *Fl. N. Am.* i. 465. — Dietrich, *Syn.* iii. 160. — Torrey, *Fl. N. Y.* i. 222. — Chapman, *Fl.* 127. — Wenzig, *Linnæa*, xxxviii. 129. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 66. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 79; *Garden and Forest*, ii. 423, f. 126. — Watson & Coulter, *Gray's Man.* ed. 6, 166.

Cratægus leucophlœos, Moench, *Bäume Weiss.* 31, t. 2. — Regel, *Act. Hort. Petrop.* i. 106. — Lavallée, *Arb. Segrez.* 77, t. 22.

Mespilus Calpodendron, Ehrhart, *Beitr.* ii. 67. — Burgsdorf, *Anleit.* pt. ii. 147.

Cratægus pyrifolia, Aiton, *Hort. Kew.* ii. 168. — Willdenow, *Berl. Baumz.* 83; *Spec.* ii. pt. ii. 1001. — Persoon, *Syn.* ii. 36. — *Nouveau Duhamel*, iv. 131. — Poiret, *Lam. Dict.* Suppl. i. 192. — Pursh, *Fl. Am. Sept.* i. 337. — Nuttall, *Gen.* i. 305. — Elliott, *Sk.* i. 550. — De Candolle, *Prodr.* ii. 627. — Hooker, *Fl. Bor.-Am.* i. 201. — Don, *Gen. Syst.* ii. 599. — *Bot. Reg.* t. 1877. — Loudon, *Arb. Brit.* ii. 819, f. 571, t. — Kaleniczenko, *Bull. Mosc.* xlviii. pt. ii. 15.

Mespilus tomentosa, Castiglioni, *Viag. negli Stati Uniti*, ii. 293.

Mespilus latifolia, Poiret, *Lam. Dict.* iv. 444. — Desfontaines, *Hist. Arb.* ii. 156. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 450. — *Nouveau Duhamel*, iv. 150. — Spach, *Hist. Vég.* ii. 60.

Cratægus latifolia, Persoon, *Syn.* ii. 37. — De Candolle, *Prodr.* ii. 627. — Don, *Gen. Syst.* ii. 598. — Roemer, *Fam. Nat. Syn.* iii. 119.

Mespilus pyrifolia, Willdenow, *Enum.* 523; *Berl. Baumz.* ed. 2, 240. — Schmidt, *Oestr. Baumz.* iv. 34, t. 216. — Sprengel, *Syst.* ii. 507. — Hayne, *Dendr. Fl.* 78.

Mespilus lobata, Poiret, *Lam. Dict.* Suppl. iv. 71.

Cratægus lobata, De Candolle, *Prodr.* ii. 628.

Halmia tomentosa, Roemer, *Fam. Nat. Syn.* iii. 135.

Halmia tomentosa, β. pyrifolia, Roemer, *Fam. Nat. Syn.* iii. 135.

Halmia tomentosa, δ. leucophlæa, Roemer, *Fam. Nat. Syn.* iii. 135.

Halmia tomentosa, ε. Calpodendron, Roemer, *Fam. Nat. Syn.* iii. 136.

Halmia lobata, Roemer, *Fam. Nat. Syn.* iii. 136.

Cratægus tomentosa, var. **pyrifolia**, Gray, *Man.* ed. 5, 160.

A tree, fifteen or twenty feet in height, with a straight trunk five or six inches in diameter, separating, a few feet from the ground, into slender branches which often spread nearly at right angles and form a wide flat head; or frequently a shrub with many distinct straggling stems. The bark of the trunk is an eighth of an inch thick, ashy gray to dark brown, fissured, and broken on the surface into small persistent scales. The branchlets are coated at first with thick pale tomentum; as this disappears they become dark orange-color, and in their first winter they are puberulous and marked by many minute dark spots, and at the base by the conspicuous ring-like scars left by the falling of the inner bud-scales; they are ashy gray in their second year, and are slender, often contorted or zigzag, smooth, and usually unarmed, although sometimes furnished with slender ashy gray or very rarely chestnut-brown straight slender sharp spines an inch to an inch and a half in length. The winter-buds are nearly globular, and are protected by orbicular chestnut-brown scales ciliate on the margins and apiculate at the apex. The leaves are ovate to ovate-oblong, acute or rarely rounded at the apex, gradually contracted below into broad winged petioles, generally incisely lobed, and sharply and usually doubly serrate except at the base with broad spreading teeth sometimes tipped towards the lower part of the blade with minute glands which occasionally appear also on the petioles; they are thin but firm in texture, gray-green, coated with pale persistent pubescence on the lower surface, puberulous and ultimately glabrous on the upper surface, conspicuously reticulate-veined, with broad midribs and primary veins, from two to five inches in length and from an inch to three inches in breadth. The stipules are linear, acute, minutely

glandular-serrate, and from one quarter to one half of an inch long. The leaves turn brilliant orange and scarlet in the autumn before falling. The flowers are produced in broad leafy pubescent slender-branched cymes with lanceolate acute minutely glandular-serrate bracts and bractlets. They are half an inch across and have a strong disagreeable odor, and in Texas open as early as the middle of March and at the north in the middle of June, or some two weeks later than those of the forms of *Cratægus coccinea* with which this species has often been confounded. The calyx is coated with pale tomentum, and is obconic with long lanceolate acute taper-pointed persistent lobes, which are deeply or pinnately serrate and usually glandular, reflexed after anthesis, and equal or exceed in length the obovate erose white petals, and glabrous pistils, which are two to five in number. The fruit is pear-shaped or rarely subglobose and half an inch broad, with a shallow cavity surrounded by the remnants of the calyx-lobes, thin dry flesh, and short obtuse thick-walled nutlets rounded and sometimes obscurely two-grooved on the back; it is erect and dull red, and remains on the branches with little loss of color until the leaf-buds unfold in the following spring.

Cratægus tomentosa is distributed from the valley of the Hudson River near Troy[1] to eastern Pennsylvania,[2] and ranges westward through central New York to central Michigan, and Missouri; it occurs on the Alleghany Mountains from northern Georgia to central Tennessee, and extends through Arkansas to eastern Texas.[3] It usually grows in low rich soil in the neighborhood of streams and on the margins of the forest, and, except in western New York and southeastern Missouri, is not known to be very common.

The wood of *Cratægus tomentosa* is heavy, hard, and close-grained, and contains numerous thin medullary rays; it is bright reddish brown, with thick lighter colored sapwood. The specific gravity of the absolutely dry wood is 0.7585, a cubic foot weighing 47.57 pounds.

Cratægus tomentosa is often found in English gardens, where it was introduced by Lee & Kennedy in 1765,[4] and in those of France and Germany. The brilliant color of its foliage in autumn and the persistence of the fruit on its branches during the winter constitute its chief value as an ornamental plant.

[1] *Cratægus tomentosa* was discovered here by Professor H. G. Jesup in June, 1889.

[2] It was detected by Professor Thomas C. Porter on Chestnut Hill, Easton, Pennsylvania, in May, 1889.

[3] It was found near Dallas by Mr. J. Reverchon in 1880.

[4] Aiton, *Hort. Kew.* ii. 168. — Loudon, *Arb. Brit.* ii. 819, f. 571, t.

EXPLANATION OF THE PLATE.

PLATE CLXXXIII. CRATÆGUS TOMENTOSA.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. A subglobose fruit, natural size.
5. Cross section of a fruit, enlarged.
6. A fruit, a part of the flesh removed, showing the nutlets, enlarged.
7. A nutlet, natural size.
8. A nutlet divided transversely, enlarged.
9. Portion of a leafy shoot with stipules, natural size.
10. Winter-buds, natural size.

C.E. Faxon del. Picart sc.

CRATÆGUS TOMENTOSA, L.

A. Riocreux direx.t Imp. R. Taneur, Paris.

CRATÆGUS PUNCTATA.

Haw.

Leaves wedge-obovate, prominently veined.

Cratægus punctata, Jacquin, *Hort. Vind.* i. 10, t. 28. — Willdenow, *Berl. Baumz.* 86; *Spec.* ii. pt. ii. 1004. — Michaux, *Fl. Bor.-Am.* i. 289. — Persoon, *Syn.* ii. 37. — Pursh, *Fl. Am. Sept.* i. 338. — Elliott, *Sk.* i. 548. — Torrey, *Fl. N. Y.* i. 222. — De Candolle, *Prodr.* ii. 627. — Hooker, *Fl. Bor.-Am.* i. 201 (excl. var.). — Don, *Gen. Syst.* ii. 598. — Torrey & Gray, *Fl. N. Am.* i. 466. — Dietrich, *Syn.* iii. 159. — Emerson, *Trees Mass.* 435. — Darlington, *Fl. Cestr.* ed. 3, 84. — Provancher, *Flore Canadienne*, 211. — Regel, *Act. Hort. Petrop.* i. 106. — Kaleniczenko, *Bull. Mosc.* xlviii. pt. ii. 14. — Watson & Coulter, *Gray's Man.* ed. 6, 166.

Mespilus cornifolia, Muenchhausen, *Hausv.* v. 145. — Poiret, *Lam. Dict.* iv. 444. — Koch, *Dendr.* i. 134.

Mespilus cuneiformis, Marshall, *Arbust. Am.* 88.

Cratægus Crus-galli, Wangenheim, *Nordam. Holz.* 52 (not Linnæus). — Du Roi, *Harbk. Baumz.* i. 195.

Mespilus cuneifolia, Ehrhart, *Beitr.* iii. 21 (not Moench). — Schmidt, *Oestr. Baumz.* iv. 34, t. 215. — Sprengel, *Syst.* ii. 506. — Spach, *Hist. Vég.* ii. 61.

Mespilus punctata, Loiseleur, *Nouveau Duhamel*, iv. 152. — Willdenow, *Enum.* 524; *Berl. Baumz.* ed. 2, 243. — Poiret, *Lam. Dict.* Suppl. iv. 70. — Hayne, *Dendr. Fl.* 79. — Watson, *Dendr. Brit.* i. 57, t. 57. — Spach, *Hist. Vég.* ii. 61. — Wenzig, *Linnæa*, xxxviii. 128.

Mespilus pyrifolia, Desfontaines, *Hist. Arb.* ii. 156 (not Willdenow). — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 452. — Spach, *Hist. Vég.* ii. 60, t. 10, f. C.

Cratægus punctata, var. **rubra**, Aiton, *Hort. Kew.* ii. 170.

Cratægus punctata, var. **aurea**, Aiton, *Hort. Kew.* ii. 170.

Cratægus latifolia, De Candolle, *Prodr.* ii. 627.

Cratægus flava, Darlington, *Fl. Cestr.* ed. 2, 292 (not Aiton).

Mespilus Trewiana, Tausch, *Regensb. Flora*, 1838, pt. ii. 716.

Cratægus cuneifolia, Roemer, *Fam. Nat. Syn.* iii. 118.

Cratægus obovatifolia, Roemer, *Fam. Nat. Syn.* iii. 120.

Halmia punctata, Roemer, *Fam. Nat. Syn.* iii. 134.

Halmia cornifolia, Roemer, *Fam. Nat. Syn.* iii. 135.

Phænopyrum Trewianum, Roemer, *Fam. Nat. Syn.* iii. 154.

Cratægus tomentosa, var. **punctata**, Gray, *Man.* ed. 2, 124. — Chapman, *Fl.* 127. — Brunet, *Cat. Vég. Lig. Can.* 26. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 80. — Macoun, *Cat. Can. Pl.* i. 147.

Cratægus tomentosa, var. **plicata**, Wood, *Cl. Book*, 330; *Bot. and Fl.* 111.

Cratægus punctata, var. **xanthocarpa**, Lavallée, *Arb. Segrez.* i. 53, t. 16.

A tree, twenty to thirty feet in height, with a trunk occasionally eight or ten inches in diameter, and stout branches spreading nearly at right angles with the stem and forming a broad round or flat-topped head. The bark of the trunk is from one sixteenth to one eighth of an inch thick, with a dark red-brown surface broken into long persistent plate-like scales. The branchlets are coated at first with pale pubescence; this soon disappears, and in their first winter they are light brown and conspicuously marked at the base by the scars left by the inner scales of the leaf-buds; in their second year they are ashy gray, silvery white, or light brown, and ultimately become light brown, and are slender, rigid, armed with straight sharp light brown spines two to three inches long, or often unarmed. The winter-buds are obtuse, one eighth of an inch across, and covered by pale brown lustrous orbicular apiculate scales. The leaves are wedge-obovate, pointed or rounded at the apex, contracted below into long winged petioles, sharply and often doubly serrate above the middle with minutely apiculate teeth, entire or nearly so below, and sometimes, especially on vigorous shoots, more or less incisely lobed; when they unfold they are covered on the lower surface with thick pale pubescence and are pilose on the upper surface; at maturity they are thick and firm, pale gray-green and glabrous on the upper surface, the broad prominent midribs and principal veins, which are deeply impressed above, being more or less thickly covered with pale hairs on the lower surface, two or three inches long and three quarters of an inch to an inch and a half broad. The stipules are lanceolate, acute, glandular-serrate, and caducous. The leaves turn

bright orange or orange and scarlet in the autumn. The flowers are produced in broad leafy thick-branched corymbs, covered with pale tomentum or pubescence, and furnished with long lanceolate caducous bracts and bractlets; they are borne on stout hairy pedicels, and open from the middle of May at the north to the end of June on the high mountains of North Carolina, and vary from one half to three quarters of an inch in diameter; the calyx is narrowly obconic and more or less tomentose, with a dark red disk and narrow acute nearly entire or minutely glandular-serrate persistent lobes covered on the inner surface with scattered pale hairs, and nearly as long as the white petals. There are from two to five styles surrounded at the base by conspicuous tufts of white hairs. The fruit, which ripens and falls in the autumn, is pyriform or subglobose, dull red or sometimes bright yellow, marked by numerous small white spots, and three quarters of an inch to an inch in length, with a deep cavity surrounded by the remnants of the calyx-lobes and filaments, thin dry flesh, and thick-walled nutlets rounded and slightly or deeply grooved on the back.

Cratægus punctata is distributed from the valley of the Chateaugay River in the province of Quebec, where, in the neighborhood of Montreal, it is not uncommon, to the valley of the Detroit River in Ontario; it is not rare in northern New Hampshire and Vermont, and extends south through western Massachusetts, where it abounds, and along the Appalachian Mountain system to northern Georgia, ascending in North Carolina and Tennessee to an elevation of six thousand feet above the level of the sea; it is very common in northern and western New York, ranges westward along the southern shores of the Great Lakes, and crosses the Mississippi River into eastern and southeastern Missouri. It usually grows in rich moist soil in forest glades, or in rocky upland pastures, where it often spreads into broad thickets.

The wood of *Cratægus punctata* is heavy, hard, and close-grained, with numerous thin medullary rays, and is bright red-brown, with thick pale sapwood. The specific gravity of the absolutely dry wood is 0.7681, a cubic foot weighing 47.87 pounds.

Cratægus punctata is said to have been introduced into English gardens in 1746 by the Duke of Argyll,[1] and the first description of it, published in 1770, was drawn up from plants cultivated in the Botanic Garden at Vienna.

In cultivation *Cratægus punctata* is a hardy tree of good habit, especially beautiful in the autumn, when its spreading branches are covered with its abundant and showy fruit.

[1] Aiton, *Hort. Kew.* ii. 169. — Loudon, *Arb. Brit.* ii. 818, f. 569, 570, t.

EXPLANATION OF THE PLATE.

PLATE CLXXXIV. CRATÆGUS PUNCTATA.

1. A flowering branch, natural size.
2. A flower, the petals removed, enlarged.
3. A fruiting branch, natural size.
4. Cross section of a fruit, natural size.
5. A nutlet, natural size.
6. A nutlet divided transversely, natural size.
7. The end of a leafy branch showing the stipules, natural size.
8. A subglobose yellow fruit, natural size.
9. A winter branchlet, natural size.

C.E. Faxon del. Toulet sc

CRATÆGUS PUNCTATA, Jacq.

A. Riocreux direx.t Imp. R. Taneur, Paris.

CRATÆGUS SPATHULATA.

Small Fruited Haw.

LEAVES submembranaceous, spatulate or oblanceolate, crenately toothed or lobed above the middle.

Cratægus spathulata, Michaux, *Fl. Bor.-Am.* i. 288. — Persoon, *Syn.* ii. 37. — Elliott, *Sk.* i. 552. — Loddiges, *Bot. Cab.* t. 1261. — Don, *Gen. Syst.* ii. 599. — Gray, *Bot. Reg.* under t. 1957. — Torrey & Gray, *Fl. N. Am.* i. 467. — Dietrich, *Syn.* iii. 160. — Chapman, *Fl.* 126. — Regel, *Act. Hort. Petrop.* i. 112. — Kaleniczenko, *Bull. Mosc.* xlviii. pt. ii. 31. — Ridgway, *Am. Nat.* vi. 728. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 81. — Watson & Coulter, *Gray's Man.* ed. 6, 165. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 107 (*Man. Pl. W. Texas*).

Mespilus spathulata, Poiret, *Lam. Dict.* Suppl. iv. 68. — Desfontaines, *Hist. Arb.* ii. 157. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 455. — Sprengel, *Syst.* ii. 507. — Spach, *Hist. Vég.* ii. 66. — Koch, *Dendr.* i. 137.

Cratægus microcarpa, Lindley, *Bot. Reg.* t. 1846.

Phænopyrum spathulatum, Roemer, *Fam. Nat. Syn.* iii. 155.

Cotoneaster spathulata, Wenzig, *Linnæa*, xxxviii. 201.

A tree, eighteen to twenty-five feet in height, with a straight trunk occasionally eight or ten inches in diameter, and slender upright branches; or more often a shrub with numerous spreading stems. The bark of the trunk is generally smooth, with minute red-brown appressed scales, and is rarely more than a sixteenth of an inch thick. The branchlets are slender, zigzag, and glabrous; during their first year they are light reddish brown and marked with minute pale lenticels, and later become darker brown; they are unarmed or armed with straight stout light brown spines an inch to an inch and a half in length. The winter-buds are one sixteenth of an inch long, obtuse, and protected by chestnut-brown ovate apiculate scales keeled on the back. The leaves are spatulate or oblanceolate, crenately serrate at the rounded or acuminate apex, on fertile branchlets fascicled, nearly sessile, three quarters of an inch to an inch long and one quarter of an inch broad, or on young sterile branches or vigorous shoots scattered, often deeply three-lobed above the middle, with rounded crenately serrate lobes deeply and sharply incised, contracted below into long winged petioles, and one to two inches in length, and an inch to an inch and a half in breadth; they are deciduous, subcoriaceous, glabrous, dark green, and lustrous above, paler below, and reticulate-veined, with very obscure midribs and primary veins, except on those of vigorous shoots, which have broad and thick midribs often pilose along their lower surface. The stipules are linear, acute, minute, and caducous, or on vigorous shoots are foliaceous, lunate, sharply serrate, stalked, and often half an inch broad. The flowers, which appear from March to May after the leaves are grown to their full size, are produced on long slender pedicels in glabrous many-flowered narrow cymes with linear-lanceolate deciduous bracts and bractlets; they are half an inch across when expanded, with broadly obconic calyx-tubes and short nearly entire persistent calyx-lobes, minutely glandular-apiculate, and much shorter than the white undulate-margined petals, and than the styles, which are two to five in number. The fruit, which ripens in October, is subglobose, crowned with the remnants of the calyx-lobes and filaments, lustrous, bright scarlet, and one eighth of an inch in diameter, with thin dry flesh, nearly orbicular thin brittle-walled nutlets rounded or slightly grooved on the back, and minute seeds covered with a thin brown coat.

Cratægus spathulata is distributed through the coast region of the southern Atlantic states from southern Virginia to northern Florida, and extends westward through the Gulf states to the valley of the Washita River in Arkansas, where it is abundant in the neighborhood of the Hot Springs, and to the valley of the Colorado River in Texas. It grows in rich soil, usually near the banks of streams or

swamps, or in low moist depressions in the Pine forests, and attains its greatest size on the bottom-lands of western Louisiana and eastern Texas.

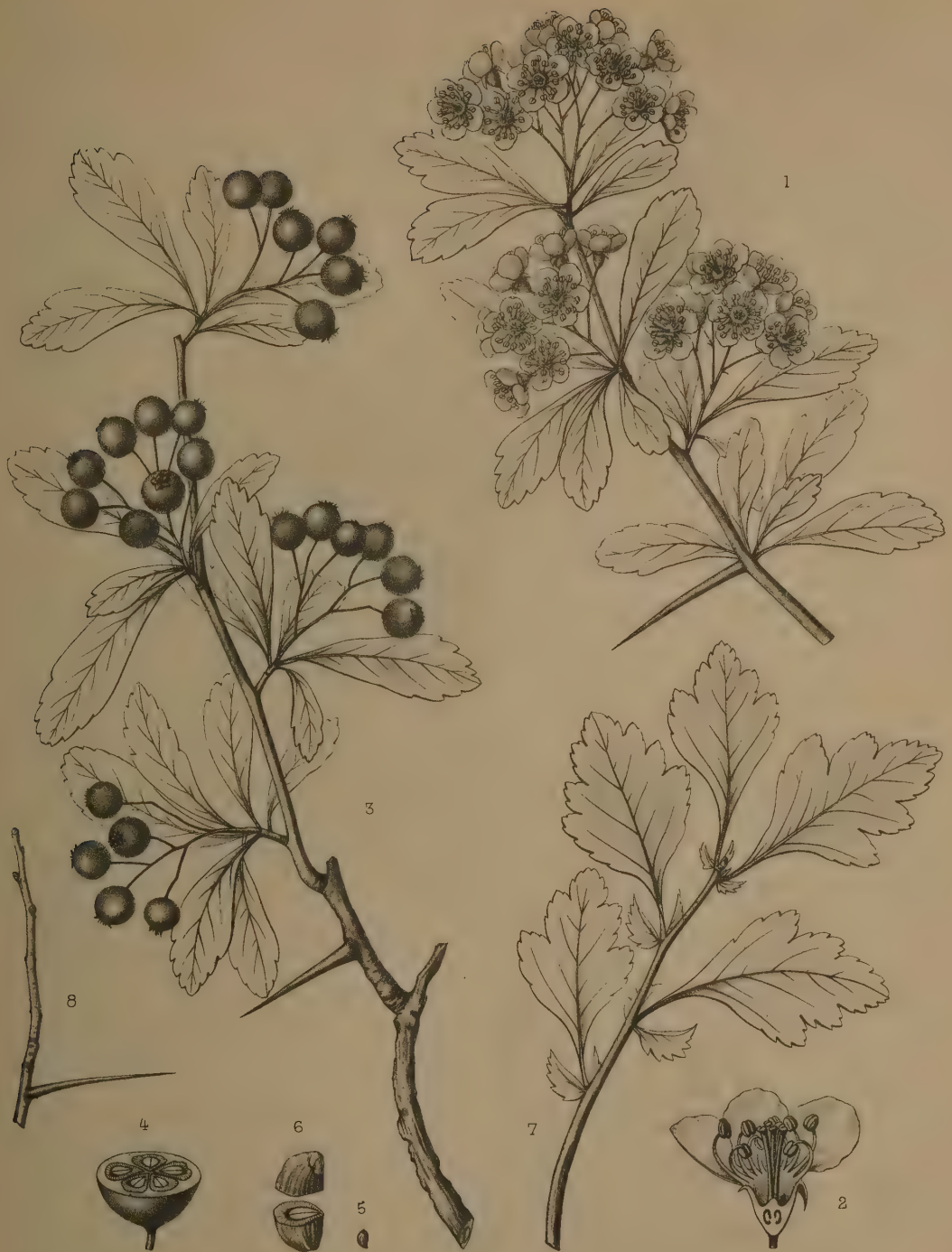
The wood of *Cratægus spathulata* is heavy, hard, and close-grained, although not strong; it is light brown or red, with thick lighter colored sapwood, and contains numerous very obscure medullary rays. The specific gravity of the absolutely dry wood is 0.7159, a cubic foot weighing 44.61 pounds.

Cratægus spathulata was discovered late in the last century by the French botanist Michaux in South Carolina; it was introduced into French and English gardens early in the present century, but probably no longer occurs in cultivation.

EXPLANATION OF THE PLATE.

PLATE CLXXXV. CRATÆGUS SPATHULATA.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. Cross section of a fruit, enlarged.
5. A nutlet, natural size.
6. A nutlet divided transversely, enlarged.
7. The end of a leafy shoot showing stipules.
8. A winter branchlet, natural size.



C. E. Faxon del. Picart fr. sc.

CRATÆGUS SPATHULATA, Michx.

A. Riocreux direx.t Imp R. Taneur, Paris.

CRATÆGUS CORDATA.

Washington Thorn.

LEAVES broadly ovate to triangular, acute, long-petiolate.

Cratægus cordata, Aiton, *Hort. Kew.* ii. 168. — Willdenow, *Berl. Baumz.* 82; *Spec.* ii. pt. ii. 1000. — Persoon, *Syn.* ii. 36. — Elliott, *Sk.* i. 554. — De Candolle, *Prodr.* ii. 628. — Watson, *Dendr. Brit.* i. 63, t. 63. — *Bot. Reg.* t. 1151. — Hooker, *Fl. Bor.-Am.* i. 201. — Don, *Gen. Syst.* ii. 599. — Torrey & Gray, *Fl. N. Am.* i. 467. — Loudon, *Arb. Brit.* ii. 825, t. — Dietrich, *Syn.* iii. 160. — Chapman, *Fl.* 127. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 82. — Regel, *Act. Hort. Petrop.* i. 114. — Kaleniczenko, *Bull. Mosc.* xlviii. pt. ii. 31. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 80. — Watson & Coulter, *Gray's Man.* ed. 6, 165.

Mespilus cordata, Miller, *Dict.* ed. 8, No. 4. — Du Roi, *Harbk. Baumz.* ed. 2, i. 615. — Willdenow, *Enum.* 523; *Berl. Baumz.* ed. 2, 239. — Hayne, *Dendr. Fl.* 77. — Schmidt, *Oestr. Baumz.* iv. 31, t. 211. — Guimpel, Otto & Hayne, *Abbild. Holz.* 167, t. 142. — Sprengel, *Syst.* ii. 507. — Koch, *Dendr.* i. 138.

Mespilus Phænopyrum, Linnæus f. *Syst.* Suppl. ed. 13, 254. — Ehrhart, *Beitr.* i. 182; ii. 67. — Moench, *Meth.* 685. — Poiret, *Lam. Dict.* iv. 446.

Cratægus acerifolia, Moench, *Bäume Weiss.* 31.

Mespilus acerifolia, Burgsdorf, *Anleit.* pt. ii. 147. — Poiret, *Lam. Dict.* iv. 442. — *Nouveau Duhamel*, iv. 151. — Spach, *Hist. Vég.* ii. 65.

Cratægus populifolia, Walter, *Fl. Car.* 147. — Pursh, *Fl. Am. Sept.* i. 337.

Mespilus corallina, Desfontaines, *Tab. École Bot. Mus.* 174. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 451. — Tausch, *Regensb. Flora*, 1838, pt. ii. 717.

Phænopyrum cordatum, Roemer, *Fam. Nat. Syn.* iii. 157.

Phænopyrum acerifolium, Roemer, *Fam. Nat. Syn.* iii. 157.

Phalacros cordatus, Wenzig, *Linnæa*, xxxviii. 164.

A tree, twenty to thirty feet in height, with a straight trunk sometimes a foot in diameter, generally dividing, four or five feet from the ground, into slender and usually upright branches which form a handsome oblong or occasionally a round head; or often much smaller and sometimes only a broad spreading bush. The bark of the trunk is light brown and an eighth of an inch thick, the generally smooth surface being broken into long persistent scales. The branchlets are slender, often zigzag, glabrous, pale orange-brown when they first appear, bright chestnut-brown and lustrous and marked by small lenticels in their first winter, and ultimately dark gray or reddish brown, and are armed with slender sharp spines an inch and a half to two inches in length; these, which sometimes terminate sterile lateral branches also, are bright chestnut-brown at first and finally, like the bark of the branches, gray or red-brown. The winter-buds are one sixteenth of an inch long and are protected by obovate apiculate light brown lustrous scales rounded on the back. The leaves are broadly ovate to triangular, acute at the apex, truncate, slightly wedge-shaped or cordate at the base, incisely three to five-cleft or three-lobed, and sharply serrate except at the base with acute or spreading often glandular-tipped teeth; they are subcoriaceous, dark green and lustrous above and pale below, glabrous except for a few deciduous hairs on the upper surface when they unfold, or rarely pubescent on the lower surface, especially on the conspicuous orange-colored midribs and primary veins; they are one and a half to two inches long and an inch to an inch and a half broad, and are borne on slender terete petioles three quarters of an inch to an inch and a half in length. The stipules are lanceolate, acute, entire, half an inch long, and caducous. The leaves turn very late in the autumn bright scarlet and orange before falling. The flowers, which open in the last days of May after the leaves are fully grown, are produced in few-flowered spreading slender-branched corymbs with lanceolate acute minute bracts and bractlets mostly caducous before the expansion of the flower-buds. The calyx is broadly obconic and glabrous, with short or nearly triangular persistent entire lobes abruptly contracted at the apex into minute points, pubescent on the inner surface, bearded on the margins, and much shorter than the obovate white petals;

there are two to five styles surrounded at the base with conspicuous tufts of pale hairs. The fruit ripens in September and October, and remains on the branches until late in the spring of the following year, although it loses its color early in the winter; it is depressed-globular, with a shallow cavity surrounded by the remnants of the reflexed calyx-lobes and filaments.

Cratægus cordata is distributed from the valley of the upper Potomac River in Virginia,[1] southward in the foothill region of the Appalachian Mountains to northern Georgia and Alabama, and westward through middle Tennessee and Kentucky to the valley of the lower Wabash River in Illinois.[2] It grows near the banks of streams in rich moist soil, and is nowhere very common.

The wood of *Cratægus cordata* is heavy, hard, and close-grained; it contains many obscure medullary rays and is brown tinged with red, with thick lighter colored sapwood. The specific gravity of the absolutely dry wood is 0.7293, a cubic foot weighing 45.45 pounds.

Cratægus cordata was known in Europe before the end of the seventeenth century, and Plukenet published in his *Phytographia*, in 1691,[3] a figure which well represents the foliage, and which was probably made from a cultivated tree.

As an ornamental plant *Cratægus cordata* is one of the most valuable of the genus, and few small trees of the North American forests exceed it in beauty; it is hardy as far north at least as New England, where it flowers in the middle of June and later than any other Hawthorn; it grows rapidly, its habit is excellent, its handsome foliage is seldom injured by fungal diseases, and, late in the autumn after the leaves of many trees have fallen, changes slowly to brilliant shades of orange and scarlet which heighten the effect produced by the bright persistent fruit.

The Washington Thorn was once much used in the middle states for hedges, and is still occasionally planted in American gardens; it is better known, however, in those of Europe, and fine old specimens are not uncommon in England, France, and Germany.

[1] *Cratægus cordata* now grows spontaneously and perhaps naturally, as Professor Porter believes, in Penryn, Lebanon County, Pennsylvania, where it was found in 1891 by Mr. J. K. Small.

[2] Patterson, *Cat. Pl. Ill.* 13.

[3] *Mespilus Virginiana Apii folio, vulgari similis major, grandioribus spinis*, t. 46, f. 3; *Alm. Bot.* 249. — Miller, *Dict.* No. 10. — *Cat. Pl. Lond.* 49, t. 3, f. 1. *Mespilus folio cordato ovatis acuminatis margìnibus acute serratis ramis spinosis*, Miller, *Dict. Icon.* 119, t. 179.

The popular name by which *Cratægus cordata* is best known, at least in American gardens, is said to be due to the fact that early in the century it was introduced from the neighborhood of the city of Washington into Chester County, Pennsylvania, where it was afterwards more generally used than any other plant for hedges (Darlington, *Fl. Cestr.* ed. 3, 83).

EXPLANATION OF THE PLATE.

PLATE CLXXXVI. CRATÆGUS CORDATA.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. A fruit, a part of the flesh removed, showing nutlets, enlarged.
5. A nutlet, natural size.
6. A nutlet divided transversely, enlarged.
7. A leaf of a vigorous young shoot with stipules, natural size.
8. A winter branchlet, natural size.

C.E.Faxon del. Picart sc.

CRATÆGUS CORDATA, Ait.

A.Riocreux direx.t Imp.R.Taneur, Paris.

CRATÆGUS VIRIDIS.

Haw.

LEAVES ovate to ovate-oblong or oblong-obovate.

Cratægus viridis, Linnæus, *Spec.* 476. — Willdenow, *Spec.* ii. pt. ii. 1001. — Persoon, *Syn.* ii. 36. — De Candolle, *Prodr.* ii. 630. — Don, *Gen. Syst.* ii. 601. — Sargent, *Garden and Forest*, ii. 411. — Watson & Coulter, *Gray's Man.* ed. 6, 165.

Cratægus arborescens, Elliott, *Sk.* i. 550. — Torrey & Gray, *Fl. N. Am.* i. 466. — Dietrich, *Syn.* iii. 160. — Walpers, *Rep.* ii. 58. — Nuttall, *Sylva*, ii. 10, t. 45. — Chapman, *Fl.* 127. — Wenzig, *Linnæa*, xxxviii. 203. — Engelmann, *Bull. Torrey Bot. Club*, ix. 4. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 75. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 107 (*Man. Pl. W. Texas*).

Phænopyrum arborescens, Roemer, *Fam. Nat. Syn.* iii. 153.

Cratægus Crus-galli, var. **pyracanthifolia**, Regel, *Act. Hort. Petrop.* i. 109 (in part).

A tree, twenty to thirty-five feet in height, with a straight often fluted trunk eight to twelve feet tall and eighteen to twenty inches in diameter, and slender spreading branches which form a round rather compact head. The bark of the trunk is one eighth of an inch thick and is ashy gray to bright reddish brown, and divided by shallow reticulated fissures into small irregular plate-like scales. The branches are slender, glabrous, in their first winter sometimes ashy gray but usually light red-brown and lustrous and marked with minute lenticels, and later pale brown, ashy gray, or nearly white; they are unarmed or occasionally are furnished with slender sharp pale spines three quarters of an inch to an inch in length. The winter-buds are obtuse, chestnut-brown, one sixteenth of an inch long, and covered by ovate minute apiculate scales slightly scarious on the margins; the scales of the inner ranks are foliaceous, lanceolate to oblanceolate, and are sometimes half an inch long at maturity and bright red towards the apex. The leaves are ovate to ovate-oblong or oblong-obovate, acute or sometimes rounded at the apex, wedge-shaped and gradually contracted at the base into long slender petioles, sharply serrate except at the base with spreading teeth often tipped with minute glands, and sometimes three-lobed towards the summit, especially on vigorous shoots; they are membranaceous to subcoriaceous, dark green and lustrous on the upper, and paler on the lower surface, with tufts of pale hairs in the axils of the conspicuous primary veins, one to three inches long and half an inch to an inch and a half broad, with wide thick midribs, and are borne on petioles which vary from an inch to an inch and a half in length. The stipules are linear, acute, half an inch long, and caducous. The leaves turn brilliant scarlet late in the autumn before falling. The flowers, which appear from the end of March in Texas to the beginning of May in Missouri when the leaves are almost fully grown, are three quarters of an inch across when expanded, and are produced in many-flowered leafy glabrous thin-branched corymbs furnished with narrow spatulate often glandular-serrate deciduous bracts and bractlets; the calyx is obconic and glabrous or covered with long pale hairs, and its lanceolate entire lobes are subulate at the apex, reflexed after anthesis, persistent, and much shorter than the broadly obovate white petals; the styles, which vary from two to five in number, are surrounded at the base by conspicuous tufts of pale hairs. The fruit ripens in the autumn and remains on the branches through the winter without changing color; it is depressed-globular, bright scarlet or occasionally orange, and one eighth of an inch in diameter, with a shallow cavity surrounded by the remnants of the calyx-lobes and filaments, thin dry flesh, and thin-walled nutlets narrowed and rounded at the two ends, rounded and barely grooved or ridged on the back, and minute seeds covered with a thin pale brown coat.[1]

[1] West of the Mississippi River from St. Louis to central Arkansas a form with larger, rather thicker, more lustrous leaves and larger fruit is not uncommon. It grows with the ordinary form, flowers at the same time, and is not to be distinguished from it in habit.

Cratægus viridis is distributed in the southern Atlantic states, where it is rare, from the valley of the Savannah River in South Carolina to that of the Chattahoochee in western Florida, and is common west of the Mississippi River from the neighborhood of St. Louis to the valley of the Colorado River in Texas. It grows along the borders of streams and swamps in low moist soil, and in western Louisiana and eastern Texas, where it attains its greatest size and is most abundant, often forming thickets of great extent, it makes in early spring a conspicuous and beautiful feature of the vegetation of the broad river-bottoms.

The wood of *Cratægus viridis* is heavy, hard, and close-grained, although not strong, and is susceptible of receiving a beautiful polish; it is light brown tinged with red, with thick lighter colored sapwood, and contains numerous very obscure medullary rays. The specific gravity of the absolutely dry wood is 0.6491, a cubic foot weighing 40.45 pounds. *Cratægus viridis* was known[1] by Clayton,[2] who probably sent to Linnæus the specimen upon which the species was established, although the tree is not now known to grow so far north as Virginia, the field of Clayton's botanical observations.

In 1876 *Cratægus viridis* was introduced from Missouri into the Arnold Arboretum, where it is perfectly hardy, and is conspicuous late in the autumn by the splendid color of its foliage, which at this season is unsurpassed in brilliancy by that of any other North American tree.

[1] *Mespilus inermis, foliis oblongis integris acuminatis serratis parvis, utrinque viridibus, cortice albicante, Fl. Virgin.* 163.

[2] See i. 8.

EXPLANATION OF THE PLATE.

PLATE CLXXXVII. CRATÆGUS VIRIDIS.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. A fruit with part of the flesh removed, showing the nutlets, natural size.
5. A nutlet, natural size.
6. A nutlet divided transversely, enlarged.
7. A spine, natural size.
8. End of a leafy shoot with stipules, natural size.
9. A winter branchlet, natural size.

C.E. Faxon del. Picart sc.

CRATÆGUS VIRIDIS, L.

A. Riocreux direx.t Imp. R. Taneur, Paris.

CRATÆGUS APIIFOLIA.

Parsley Haw.

LEAVES orbicular to broadly ovate, pinnately 5 to 7-cleft.

Cratægus apiifolia, Michaux, *Fl. Bor.-Am.* i. 287. — Persoon, *Syn.* ii. 38. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 454. — Pursh, *Fl. Am. Sept.* i. 336. — Nuttall, *Gen.* i. 305. — Elliott, *Sk.* i. 552. — De Candolle, *Prodr.* ii. 627. — Don, *Gen. Syst.* ii. 599. — Audubon, *Birds*, t. 192. — Torrey & Gray, *Fl. N. Am.* i. 467. — Dietrich, *Syn.* iii. 160. — Roemer, *Fam. Nat. Syn.* iii. 121. — Chapman, *Fl.* 127. — Kaleniczenko, *Bull. Mosc.* xlviii. pt. ii. 29. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 81. — Watson & Coulter, *Gray's Man.* ed. 6, 165.

Cratægus Oxyacantha?, Walter, *Fl. Car.* 147 (not Linnæus).

Mespilus apiifolia, Marshall, *Arbust. Am.* 89. — Poiret, *Lam. Dict.* Suppl. iv. 68. — Sprengel, *Syst.* ii. 508. — Spach, *Hist. Vég.* ii. 67. — Wenzig, *Linnæa*, xxxviii. 152.

Cratægus Oxyacantha, var. **Americana**, Castiglioni, *Viag. negli Stati Uniti*, ii. 292.

Cratægus apiifolia minor, Loudon, *Arb. Brit.* ii. 825.

Cratægus Oxyacantha, var. **apiifolia**, Regel, *Act. Hort. Petrop.* i. 119 (in part).

A tree, rarely attaining the height of twenty feet, with a slender often inclining trunk three or four inches in diameter, and branches which spread nearly at right angles and form a wide irregular open head; or more often a low shrub with many more or less contorted stems rising from the ground. The bark of the trunk is from one sixteenth to one eighth of an inch in thickness, smooth, and light gray tinged with red. The branchlets, which when they first appear are covered with long pale hairs, are slender, often zigzag and contorted, and are usually armed with stout straight chestnut-brown spines an inch to an inch and a half in length; in their first winter they are light red or pale orange-brown, marked with minute lenticels, and usually puberulous, but ultimately become light brown or ashy gray. The winter-buds are acute, one sixteenth of an inch long, and covered by lustrous chestnut-brown ovate scales apiculate at the apex and scarious on the margins. The leaves are broadly ovate to orbicular, acute at the apex, truncate, slightly cordate or wedge-shaped at the base, and pinnately five to seven-cleft with shallow acute or deep broad sinuses, and incisely lobed segments serrate towards the apex with spreading glandular-tipped teeth; when they unfold they are pilose on the upper surface with long pale hairs, and usually glabrous below, and at maturity are thin and membranaceous, bright green and rather lustrous above and paler below, glabrous or pilose on the lower surface along the prominent midribs and primary veins, or occasionally covered with pubescence on both surfaces, and are two thirds of an inch to an inch and a half broad, and borne on slender pubescent or ultimately glabrous petioles an inch to an inch and a half in length. The stipules are linear, acute, a quarter of an inch long, and caducous, or on vigorous shoots are foliaceous, lunate, coarsely glandular-serrate, short-stalked, and sometimes half an inch in length. The flowers, which appear late in March or early in April when the leaves are fully grown, are half an inch across and are produced on long slender pedicels in few-flowered villose-pubescent somewhat simple corymbs with minute lanceolate acute colored caducous bracts and bractlets; the calyx-tube is narrowly obconic and glabrous or villose-pubescent, with lanceolate acute usually glandular-serrate lobes, often tinged with red towards the apex, reflexed after anthesis, and deciduous or sometimes persistent. The fruit, which ripens in October and remains on the branches until the beginning of winter, is oblong, from a quarter to a third of an inch in length, and bright scarlet, with a minute cavity surrounded by the remnants of the calyx, thin flesh, and one to three thick-walled rugose nutlets barely grooved on the back.

Cratægus apiifolia is distributed through the coast region of the southern Atlantic states from southern Virginia to central Florida, and ranges westward through the Gulf region to southern Arkan-

sas and the valley of the Trinity River in Texas. It is nowhere very common, and usually grows near the borders of streams and swamps in low rich soil, or in Florida on hummocks in the Pine barrens, where it attains its greatest size.

The wood of *Cratægus apiifolia* is heavy, hard, very close-grained, and susceptible of receiving a beautiful polish; it contains many thin very obscure medullary rays, and is light brown tinged with red or rose, with lighter colored sapwood. The specific gravity of the absolutely dry wood is 0.7453, a cubic foot weighing 46.45 pounds.

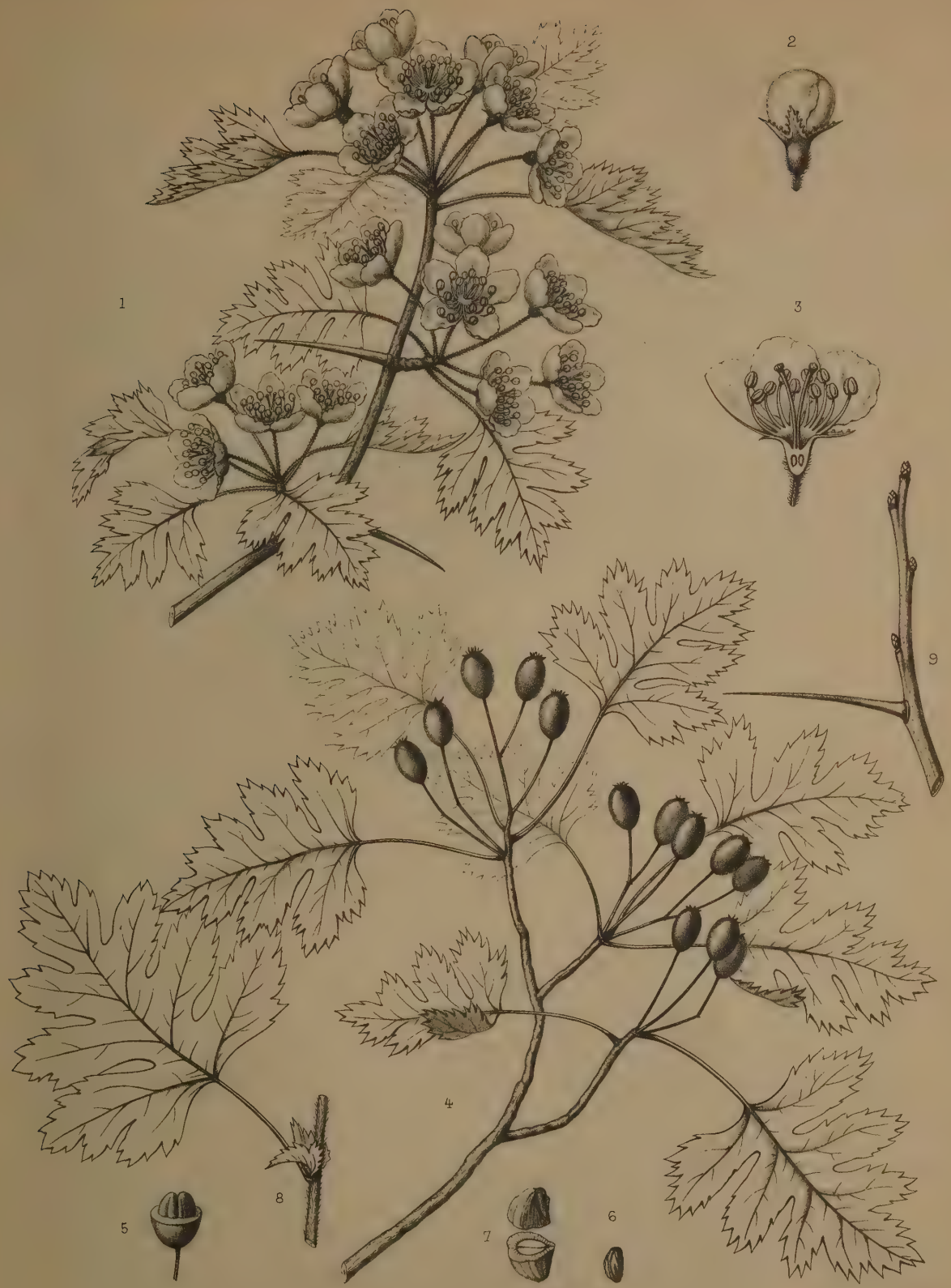
The earliest account of *Cratægus apiifolia* appears in the *Flora Caroliniana* of Walter, who mistook it for the European Hawthorn. It appears to have been introduced into English gardens [1] early in the present century, but, although the form of its delicate leaves and the abundance of its flowers make it one of the most attractive of the American Hawthorns, it is still an extremely rare plant in cultivation.

[1] Loudon, *Arb. Brit.* ii. 824.

EXPLANATION OF THE PLATE.

Plate CLXXXVIII. Cratægus apiifolia.

1. A flowering branch, natural size.
2. A flower-bud, enlarged.
3. Vertical section of a flower, enlarged.
4. A fruiting branch, natural size.
5. A fruit with part of the flesh removed, showing the nutlets, enlarged.
6. A nutlet, natural size.
7. A nutlet divided transversely, enlarged.
8. A leaf from a vigorous shoot with stipules, natural size.
9. A winter branchlet, natural size.



C.E. Faxon del. Picart fr. sc.

CRATÆGUS APIIFOLIA, Michx.

A. Riocreux direx.t Imp. R. Taneur, Paris.

CRATÆGUS FLAVA.

Summer Haw. Yellow Haw.

Leaves rhombic-obovate.

Cratægus flava, Aiton, *Hort. Kew.* ii. 169. — Willdenow, *Spec.* ii. pt. ii. 1002. — Persoon, *Syn.* ii. 37. — Pursh, *Fl. Am. Sept.* i. 338. — Nuttall, *Gen.* i. 305. — De Candolle, *Prodr.* ii. 628. — Watson, *Dendr. Brit.* i. 59, t. 59. — Don, *Gen. Syst.* ii. 600. — *Bot. Reg.* t. 1939. — Torrey & Gray, *Fl. N. Am.* i. 468. — Dietrich, *Syn.* iii. 160. — Chapman, *Fl.* 128. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 83. — Regel, *Act. Hort. Petrop.* i. 123. — Kaleniczenko, *Bull. Mosc.* xlviii. pt. ii. 27. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 82. — Watson & Coulter, *Gray's Man.* ed. 6, 166.

Cratægus glandulosa, Aiton, *Hort. Kew.* ii. 168 (not Willdenow). — Persoon, *Syn.* ii. 37. — Poiret, *Lam. Dict.* Suppl. iv. 69 (excl. syn. Moench).

Mespilus Caroliniana, Poiret, *Lam. Dict.* iv. 442. — Desfontaines, *Hist. Arb.* ii. 156. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 449. — Schmidt, *Oestr. Baumz.* iv. 32, t. 212. — Sprengel, *Syst.* ii. 507.

Cratægus Caroliniana, Persoon, *Syn.* ii. 36. — Elliott, *Sk.* i. 554.

Mespilus flava, Willdenow, *Enum.* 523. — Poiret, *Lam. Dict.* Suppl. iv. 70. — Spach, *Hist. Vég.* ii. 59, t. 10, f. H.

Cratægus turbinata, Pursh, *Fl. Am. Sept.* ii. Suppl. 735. — Poiret, *Lam. Dict.* Suppl. v. 543. — Elliott, *Sk.* i. 549. — De Candolle, *Prodr.* ii. 627. — Don, *Gen. Syst.* ii. 599.

Mespilus turbinata, Sprengel, *Syst.* ii. 506. — Spach, *Hist. Vég.* ii. 66.

Cratægus lobata, De Candolle, *Prodr.* ii. 628. — Don, *Gen. Syst.* ii. 599. — Loudon, *Arb. Brit.* ii. 824, f. 554, 586.

Cratægus flava, var. **lobata**, Lindley, *Bot. Reg.* t. 1932.

Anthomeles flava, Roemer, *Fam. Nat. Syn.* iii. 142.

Anthomeles glandulosa, Roemer, *Fam. Nat. Syn.* iii. 141.

Anthomeles turbinata, Roemer, *Fam. Nat. Syn.* iii. 142.

Phænopyrum Carolinianum, Roemer, *Fam. Nat. Syn.* iii. 152.

Mespilus flexispina, Koch, *Dendr.* i. 139 (not Moench). — Wenzig, *Linnæa*, xxxviii. 127.

A tree, twenty to twenty-five feet in height, with a straight stout trunk ten or twelve inches in diameter, dividing, five or six feet from the ground, into short spreading often pendulous branches which form a handsome compact round head; or often a wide much-branched shrub only a few feet high. The bark of the trunk varies from half an inch to an inch in thickness and is dark brown tinged with red or nearly black and often deeply furrowed, the surface being broken into small square persistent scales. The branchlets are at first villose-pubescent with long pale hairs, and often puberulous in their first winter but ultimately glabrous; they are slender, very zigzag, unarmed, or armed with straight stout spines an inch to an inch and a half in length, and are red-brown, dark gray-brown, or nearly black. The winter-buds are globose, one sixteenth of an inch in diameter, and covered with bright chestnut-brown orbicular scales slightly scarious on the margins; the scales of the inner ranks at maturity are spatulate, rounded at the apex, glandular-serrate, and often half an inch in length. The leaves are rhombic-ovate to obovate-cuneiform, three to five-ribbed, with obscure reticulated veinlets, rounded and sometimes abruptly contracted into short points, gradually narrowed below into broad winged glandular petioles, glandular-serrate with large dark glands, often incised and three to five-lobed on vigorous shoots; when they unfold they are puberulous above and pubescent below, especially along the principal veins, and at maturity are subcoriaceous, yellow-green and lustrous on the upper, and pale and sometimes pubescent on the lower surface, an inch to an inch and a half long, two thirds of an inch to an inch and a quarter broad, and borne on glabrous or pubescent petioles which vary from half an inch to an inch and a half in length. The stipules are glandular-serrate, linear, acute, pubescent, and a quarter of an inch long, or on vigorous shoots are foliaceous, stalked, obovate or lunate, variously and irregularly lobed and incised, and sometimes nearly an inch in length. The flowers, which appear in March and April when the leaves are almost fully grown, are half an inch across when expanded and are produced in simple one to four-flowered thick-branched corymbs; these, like the obovate glandular-serrate caducous bracts and

bractlets, the thick pedicels, and the narrowly obconic calyx-tubes, are coated with thick pale tomentum or are pubescent or puberulous; the calyx-lobes are lanceolate, acute, conspicuously glandular-serrate, or rarely entire and eglandular, pubescent on the outer, and usually glabrous on the inner surface, reflexed after anthesis, persistent, and rather shorter than the white petals which are often erose or crenate on the margins; the disk is dark red and glandular, and around the base of the styles, which are usually four or five in number, are tufts of pale hairs. The fruit is produced sparingly, and ripens and falls in the autumn; it is pyriform or subglobose, half an inch long, and usually greenish yellow or yellow tinged with red, with a deep cavity surrounded by the long conspicuous calyx-lobes, thin austere flesh, and thick-walled nutlets rounded or obscurely grooved on the back.

Cratægus flava extends from the coast region of southern Virginia southward to the shores of Tampa Bay, Florida, and ranges inland to the western slopes of the Alleghany Mountains of North Carolina and along the Gulf coast through southern Alabama and Mississippi. It usually grows in dry sandy soil on the borders of the Pine forests, or occasionally in lower situations near streams subject to overflow, and although generally distributed is nowhere very common, usually appearing singly or in groups of two or three individuals.

The wood of *Cratægus flava* is heavy, hard, and close-grained, with a satiny surface susceptible of receiving a good polish; it is light brown tinged with red or rose-color, with thick lighter colored sapwood, and contains numerous very obscure medullary rays. The specific gravity of the absolutely dry wood is 0.7809, a cubic foot weighing 48.67 pounds.

A variety of *Cratægus flava*[1] may be distinguished by its thicker broader leaves; these are usually rounded at the apex, more uniformly lobed and coated with pubescence while young, and at maturity are thicker and more lustrous on the upper surface; by its usually smaller flowers, and by its larger subglobose bright red or yellow fruit with thicker and sweeter flesh.

This variety, *Cratægus flava*, var. *elliptica*, is generally a shrub with spreading branches, or rarely a small tree, and often forms thickets in abandoned fields in the middle districts of the Carolinas and Georgia, where it is most common, although it may be found throughout the region inhabited by *Cratægus flava*, the two forms gradually passing one into the other.

The wood of *Cratægus flava*, var. *elliptica*, is rather lighter than that of the species, although not otherwise distinguishable, the specific gravity of the absolutely dry wood being 0.7683, and a cubic foot weighing 47.88 pounds.

The fruit of the Summer Haw, as this variety is called in South Carolina and Georgia, is gathered in large quantities in those states and made into a jelly which can hardly be distinguished from that made from the West Indian Guava-tree.

Cratægus flava, according to Aiton,[2] was introduced into English gardens by Philip Miller in 1758, and the earliest descriptions of it were drawn up from cultivated plants.[3]

[1] *Cratægus flava*, var. *elliptica*.

? *Mespilus hyemalis*, Walter, *Fl. Car.* 148. — Poiret, *Lam. Dict.* iv. 447.

Cratægus viridis ?, Walter, *Fl. Car.* 147 (not Linnæus).

Cratægus elliptica, Aiton, *Hort. Kew.* ii. 168. — Willdenow, *Spec.* ii. pt. ii. 1002. — Persoon, *Syn.* ii. 37. — Pursh, *Fl. Am. Sept.* i. 337. — Nuttall, *Gen.* i. 305. — De Candolle, *Prodr.* ii. 627. — Hooker, *Fl. Bor.-Am.* i. 201 (in part). — Don, *Gen. Syst.* ii. 598. — Torrey & Gray, *Fl. N. Am.* i. 469. — Dietrich, *Syn.* iii. 159. — Regel, *Act. Hort. Petrop.* i. 122.

Mespilus elliptica, Poiret, *Lam. Dict.* iv. 447. — Wenzig, *Linnæa*, xxxviii. 125. — Koch, *Dendr.* i. 140.

Cratægus glandulosa, Michaux, *Fl. Bor.-Am.* i. 288 (not Aiton nor Willdenow). — Nuttall, *Gen.* i. 105. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 84. — Chapman, *Fl.*

Cratægus Michauxii, Persoon, *Syn.* ii. 38.

Cratægus spathulata, Pursh, *Fl. Am. Sept.* i. 336 (not Michaux). — De Candolle, *Prodr.* ii. 627. — *Bot. Reg.* t. 1890. — Lindley, *Bot. Reg.* under t. 1957.

Mespilus Michauxii, Hornemann, *Hort. Hafn.* 455. — Poiret, *Lam. Dict.* Suppl. iv. 69.

Cratægus flava, Elliott, *Sk.* i. 551 (not Aiton).

Cratægus Virginica, Loudon, *Arb. Brit.* ii. 842, f. 560, 615. — Kaleniczenko, *Bull. Mosc.* xlviii. pt. ii. 58.

Cratægus flava, var. *pubescens*, Gray, *Man.* ed. 5, 160. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 83. — Watson & Coulter, *Gray's Man.* ed. 6, 166.

Phœnopyrum Virginicum, Roemer, *Fam. Nat. Syn.* iii. 155.

Phœnopyrum ellipticum, Roemer, *Fam. Nat. Syn.* iii. 155.

[2] *Hort. Kew.* ii. 169.

[3] *Mespilus Caroliniana apii folio, vulgari similis, major, fructu luteo*, Trew, *Pl. Select.* 3, t. 17.

EXPLANATION OF THE PLATES.

Plate CLXXXIX. Cratægus flava.

1. A flowering branch, natural size.
2. A flower-bud, enlarged.
3. Vertical section of a flower, enlarged.
4. A fruiting branch, natural size.
5. A fruit divided transversely, enlarged.
6. A nutlet, natural size.
7. A nutlet divided transversely, enlarged.
8. A winter branchlet, natural size.

Plate CXC. Cratægus flava, *var.* elliptica.

1. A flowering branch, natural size.
2. A flower-bud, enlarged.
3. Vertical section of a flower, the petals removed, enlarged.
4. A fruiting branch, natural size.
5. A subglobose fruit, natural size.
6. A fruit, part of the flesh removed, showing the nutlets, enlarged.
7. A nutlet, natural size.
8. A nutlet divided transversely, enlarged.
9. A leaf from a vigorous young shoot with stipules, natural size.
10. A winter branchlet, natural size.

C.E. Faxon del. Picart fr. sc.

CRATÆGUS FLAVA, Ait.

A. Riocreux direx.t Imp. R. Taneur, Paris.

C E Faxon del. Picart fr. sc.

CRATÆGUS FLAVA, Var. ELLIPTICA, Sarg.

A. Riocreux direx.t Imp. R. Taneur, Paris

CRATÆGUS UNIFLORA.

Haw.

Leaves obovate-spatulate.

Cratægus uniflora, Muenchhausen, *Hausv.* v. 147. — Du Roi, *Harbk. Baumz.* i. 184.

Mespilus xanthocarpa, Linnæus f. *Syst.* ed. 13, Suppl. 254. — Ehrhart, *Beitr.* i. 182; ii. 67. — Burgsdorf, *Anleit.* pt. ii. 146. — Du Roi, *Harbk. Baumz.* ed. 2, i. 623. — Poiret, *Lam. Dict.* Suppl. iv. 67. — Sprengel, *Syst.* ii. 506.

Mespilus flexispina, Moench, *Bäume Weiss.* 62, t. 4; *Meth.* 685. — Wenzig, *Linnæa*, xxxviii. 127.

Mespilus Oxyacantha aurea, Marshall, *Arbust. Am.* 89.

Mespilus laciniata, Walter, *Fl. Car.* 147. — Poiret, *Lam. Dict.* iv. 447.

Cratægus parvifolia, Aiton, *Hort. Kew.* ii. 169. — Willdenow, *Berl. Baumz.* 85; *Spec.* ii. pt. ii. 1002. — Pursh, *Fl. Am. Sept.* i. 538. — Elliott, *Sk.* i. 547. — De Candolle, *Prodr.* ii. 627. — Don, *Gen. Syst.* ii. 598. — Darlington, *Fl. Cestr.* ed. 2, 291. — Torrey & Gray, *Fl. N. Am.* i. 469. — Dietrich, *Syn.* iii. 159. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 384. — Chapman, *Fl.* 128. — Watson & Coulter, *Gray's Man.* ed. 6, 166.

Cratægus tomentosa, Michaux, *Fl. Bor.-Am.* i. 289 (not Linnæus). — Regel, *Act. Hort. Petrop.* i. 122 (in part).

Mespilus parvifolia, Willdenow, *Enum.* 523; *Berl. Baumz.* ed. 2, 242. — Spach, *Hist. Vég.* ii. 55.

Mespilus axillaris, Persoon, *Syn.* ii. 39. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 447.

Cratægus unilateralis, Persoon, *Syn.* ii. 37. — De Candolle, *Prodr.* ii. 629. — Don, *Gen. Syst.* ii. 599. — Roemer, *Fam. Nat. Syn.* iii. 116.

Mespilus tomentosa, Poiret, *Nouveau Duhamel*, iv. 153 (not Castiglioni).

Mespilus unilateralis, Poiret, *Lam. Dict.* Suppl. iv. 73.

Mespilus flexuosa, Poiret, *Lam. Dict.* Suppl. iv. 73.

Cratægus flexuosa, De Candolle, *Prodr.* ii. 627. — Don, *Gen. Syst.* ii. 598.

Phænopyrum uniflorum, Roemer, *Fam. Nat. Syn.* iii. 153.

Phænopyrum parvifolium, Roemer, *Fam. Nat. Syn.* iii. 152.

Mespilus uniflora, Wenzig, *Linnæa*, xxxviii. 123.

A low shrub, with slender stems one or two feet high; or rarely a bushy tree attaining a height of ten or twelve feet, with a short stout trunk ten or twelve inches in diameter and covered with thin ashy gray furrowed bark, the surface of which separates into small appressed scales. The branches, when they first appear, are coated with thick pale pubescence which often does not disappear until the end of their second summer; they are slender, nearly straight or often zigzag, bright red-brown, dark gray in their first year and ultimately dark brown, and are armed with slender straight spines one to two inches in length, and often furnished, when they first appear, with leafy serrate green or red caducous bracts. The winter-buds are small, obtuse, and covered by chestnut-brown scales with scarious margins; the scales of the inner ranks are obovate at maturity, glandular-serrate, pubescent, pyriform to subglobose, pale greenish yellow, half an inch long, and caducous. The leaves are obovate-spatulate to oblong-cuneiform, rounded at the apex or sometimes abruptly acute, with short broad points, and are gradually contracted below into broad petioles or are sometimes nearly sessile; they are crenately serrate, the broad teeth being sometimes tipped with minute dark glands, and are occasionally incisely lobed towards the apex; when they unfold they are pilose on the upper surface with pale deciduous hairs and pubescent on the lower surface, and at maturity they are subcoriaceous, scabrous, dark green and lustrous above, and paler and pubescent below, especially along the midribs and primary veins, and vary from an inch to two inches in length and from half an inch to two thirds of an inch in width. The stipules are ovate, acute, glandular-serrate, sometimes a quarter of an inch long, and caducous. The flowers, which are solitary or rarely geminate and vary from a half to three quarters of an inch in diameter, appear from the first of April in Florida to the middle of June at the north when the leaves are fully grown; they are borne on short stout pedicels which are furnished with lanceolate acute glandular-serrate caducous bractlets, which, like the calyx, are hirsute-tomentose with long pale hairs; the calyx is narrowly obconic, with foliaceous lanceolate acute sharply incised and glandular persistent lobes

covered with pale hairs on the inner surface, reflexed after anthesis, and longer than the obovate creamy white petals and than the styles, which are usually five in number. The fruit ripens and falls in October, and is half an inch across, with a broad deep cavity surrounded by the large and conspicuous calyx-lobes, thick dry sweet flesh, and small thin-walled nutlets acute above, rounded below, and deeply grooved on the back.

Cratægus uniflora is distributed from the valley of the Delaware River in New Jersey southward to Florida, Louisiana, and southern Arkansas; it grows usually in sandy soil in abandoned fields or along the borders of the forest, and only on the banks of the Appalachicola River in Bristol, Florida, on the slopes of a ravine occupied by Torreya and the Florida Yew, has it been noticed in tree-like form.

Cratægus uniflora was probably detected by Banister,[1] who sent it, in 1713, to Bishop Compton,[2] in whose garden it first flowered in Europe, and the earliest description was made from plants cultivated in England.[3] It is still found in most botanic gardens, but is cultivated as a curiosity rather than for ornament. It is hardy as far north as eastern Massachusetts.

[1] See i. 6.

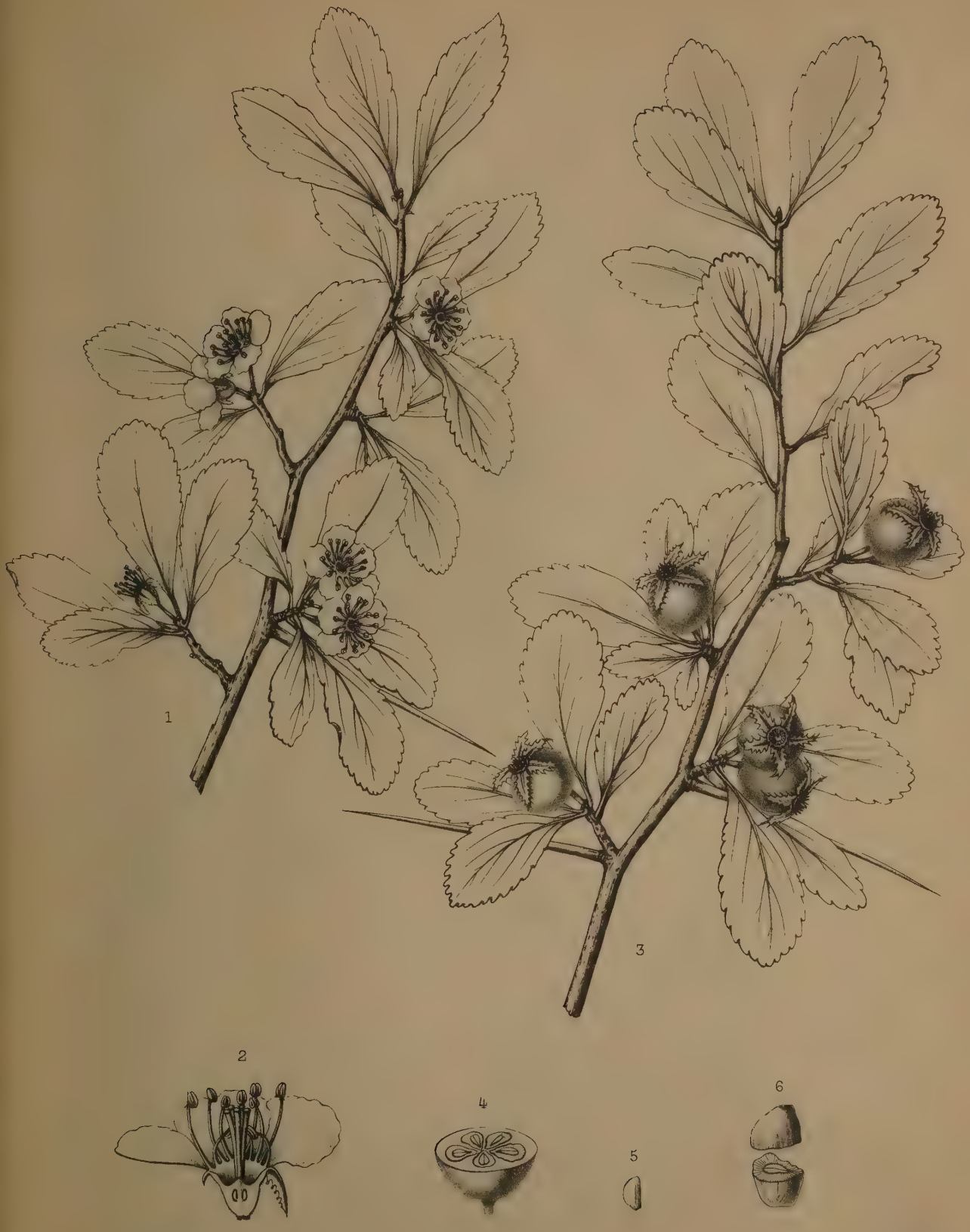
[2] See i. 6.

[3] *Mespilus foliis lanceolato-ovatis serratis subtus villosis, floribus solitariis, calycibus foliaceis, spinis longissimis tenuioribus* (Miller, *Dict.* ed. 7, No. 17). Banister's description as quoted by Miller (*Oxyacantha folio parvo subrotundo, flore unico, thecâ foliaceâ incluso summitatibus ramulorum insidente*) does not appear to have been published.

EXPLANATION OF THE PLATE.

PLATE CXCI. CRATÆGUS UNIFLORA.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. Cross section of a fruit, enlarged.
5. A nutlet, natural size.
6. A nutlet divided transversely, enlarged.



C.E. Faxon del. Toulet sc

CRATÆGUS UNIFLORA, Muench.

A. Riocreux direx.t Imp. R. Taneur, Paris.

CRATÆGUS ÆSTIVALIS.

May Haw. Apple Haw.

LEAVES elliptical to oblong-cuneiform.

Cratægus æstivalis, Torrey & Gray, *Fl. N. Am.* i. 468. — Walpers, *Rep.* ii. 58. — Dietrich, *Syn.* iii. 162. — Nuttall, *Sylva*, ii. 12. — Chapman, *Fl.* 127. — Regel, *Act. Hort. Petrop.* i. 124. — Wenzig, *Linnæa*, xxxviii. 202. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 82.

Mespilus æstivalis, Walter, *Fl. Car.* 148. — Poiret, *Lam. Dict.* iv. 447.

? **Cratægus lucida**, Elliott, *Sk.* i. 548 (not Ehrhart).

Cratægus elliptica, Elliott, *Sk.* i. 549 (not Aiton).

Cratægus opaca, Hooker & Arnott, *Compan. Bot. Mag.* i. 25.

Anthomeles æstivalis, Roemer, *Fam. Nat. Syn.* iii. 141.

A tree, twenty to thirty feet in height, with a stout trunk sometimes a foot in diameter and occasionally three or four feet tall, or more often divided close to the surface of the ground into several large upright branches which form a round compact bushy head. The bark of the trunk is a quarter of an inch thick, deeply fissured, and broken on the surface into thick dark red-brown persistent plate-like scales. The branchlets are at first covered with rufous or occasionally with pale hairs, and in their first winter are glabrous, lustrous, bright red or sometimes light brown, becoming darker brown or dark gray in their second year; they are stout, straight, or more or less zigzag, and often unarmed, or armed with stout straight lustrous spines an inch to an inch and a half long. The winter-buds are one eighth of an inch in length, oblong, obtuse, and covered with broad thick ovate scales keeled on the back, minutely apiculate, and bright chestnut-brown; the scales of the inner ranks at maturity are broadly obovate, rounded and conspicuously glandular-serrate at the apex, and from one quarter to one half of an inch in length. The leaves are elliptical to oblong-cuneiform or on sterile branches often obovate, and are acute or rounded at the apex, gradually narrowed below into stout petioles, and irregularly sinuate-toothed or angled above the middle, or crenately serrate with minute glandular-tipped teeth, or, especially on vigorous shoots, rarely three-lobed or incised; when they unfold they are covered on the upper surface with deciduous pale hairs and on the lower surface with dense rufous tomentum, and when fully grown are subcoriaceous, dark green and lustrous, glabrous or sometimes puberulous above and clothed below, especially along the broad midribs and primary veins, with thick rusty pubescence; they are an inch and a half to two inches long, half an inch to an inch wide, and are borne on petioles which are coated with rusty tomentum and vary from a quarter of an inch to an inch in length. The flowers, which appear with the unfolding of the leaves in February and early in March, are an inch across when expanded, and are produced in two to five-flowered simple glabrous corymbs on long stout pedicels furnished with lanceolate acute caducous glandular bractlets; the calyx is glabrous, turbinate, with nearly triangular persistent lobes which are minutely glandular-serrate, reflexed after anthesis, often flushed with red towards the apex, and much shorter than the obovate concave white petals. The fruit, which ripens in May, is depressed-globose, very fragrant, bright red dotted with pale spots, and half of an inch to two thirds of an inch in diameter, with a small shallow cavity surrounded by the remnants of the calyx-lobes and filaments, juicy subacid flesh, and three to five thin-walled nutlets rounded at both ends and deeply two-grooved on the back.

Cratægus æstivalis is distributed in the coast region from the valley of the Savannah River in South Carolina to northern Florida, and through the Gulf states to southern Arkansas and to the valley of the Sabine River in Texas; it grows usually in moist sandy soil near the margins of streams and Pine-barren ponds, where the ground is often submerged during several weeks in winter. It is com-

paratively rare in the Atlantic states, and is most common and attains its greatest size in western Louisiana and eastern Texas.

The wood of *Cratægus æstivalis* is heavy, hard, and close-grained, although not strong; it is light brown or red, with thick lighter colored sapwood, and contains numerous obscure medullary rays. The specific gravity of the absolutely dry wood is 0.6564, a cubic foot weighing 40.91 pounds.

The fruit, which is collected in large quantities in all the region where the May Haw is found, is sold in the markets of the towns of southwestern Louisiana and is preserved and made into jellies.

Cratægus æstivalis appears to have been first noticed by Walter, who published the earliest account of it in his *Flora Caroliniana;* it is probably still unknown in gardens, although one of the most beautiful trees of the genus. No other species produces such large flowers or such large well-flavored and valuable fruit; and as a fruit-tree the May Haw deserves the attention of pomologists in all warm-temperate countries.

EXPLANATION OF THE PLATE.

PLATE CXCII. CRATÆGUS ÆSTIVALIS.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. Cross section of a fruit, natural size.
5. A nutlet, natural size.
6. A nutlet divided transversely, enlarged.
7. A winter branchlet, natural size.

C. E. Faxon del. Picart fr. sc.

CRATÆGUS ÆSTIVALIS, Torr. et Gray.

A. Riocreux direx.t Imp. R. Taneur, Paris.

HETEROMELES.

FLOWERS regular, perfect; calyx 5-lobed, the lobes imbricated in æstivation; petals 5, convolute in æstivation; stamens 10, parapetalous; ovary 2-celled; ovules 2 in each cell, ascending. Fruit a fleshy drupe. Leaves alternate, serrate, coriaceous, persistent.

Heteromeles, Roemer, *Fam. Nat. Syn.* iii. 100.

A small tree, with smooth pale aromatic bark, stout terete branches, pubescent or puberulous while young, and fibrous roots. Leaves alternate, oblong-lanceolate, acute at the two ends, sharply and remotely serrate with rigid glandular teeth, or rarely almost entire, dark green and lustrous on the upper, paler on the lower surface, petiolate with stout grooved glandular petioles often furnished near their apex with one or two slender glandular teeth, feather-veined, with broad midribs grooved on the upper side and conspicuous reticulated veinlets; stipules subulate, ridged, minute, early deciduous. Flowers in ample tomentose terminal corymbose panicles, their branches developed from the axils of the upper leaves or from acute leafy bracts. Bractlets acute, minute, usually tipped with small glands, caducous. Pedicels stout, shorter than the turbinate calyx-tube, tomentose below, glabrate above; the lobes short, nearly triangular, spreading, persistent. Disk lining the tube of the calyx, cup-shaped, obscurely sulcate; petals five, inserted on the margin of the disk, flabellate, erose-denticulate or emarginate at the apex, contracted at the base into short broad claws, thick, glabrous, pure white. Stamens ten, inserted in one row with the petals on the margin of the disk in pairs opposite the lobes of the calyx; filaments subulate, enlarged at the base, incurved, free; anthers oblong-ovate, emarginate, attached on the back below the middle, introrse, two-celled, the cells opening longitudinally. Carpels two, adnate to the calyx-tube, at first only dorsally below the middle, and slightly united into a subglobose tomentose nearly superior ovary; styles terminal, distinct, slightly spreading, enlarged at the apex into broad truncate stigmas; ovules two in each cell, ascending, anatropous; raphe dorsal; micropyle inferior. Fruit an obovoid fleshy drupe formed by the thickening of the calyx-tube connate to their middle only with the membranaceous carpels which are coated above with long white hairs filling the cavity closed by the infolding of the thickened persistent lobes, their tips erect and crowning the fruit. Seeds usually solitary in each cell by the abortion of one of the ovules, or rarely two, ovate, lenticular, obtuse, slightly ridged on the back, destitute of albumen; testa membranaceous, puncticulate, light brown; hilum orbicular, conspicuous. Embryo filling the cavity of the seed; cotyledons plano-convex; radicle short, inferior.

The wood of Heteromeles is very heavy, hard, and close-grained, with a satiny surface susceptible of receiving a beautiful polish; it is dark red-brown, with thin lighter colored sapwood composed of seven or eight layers of annual growth. The specific gravity of the absolutely dry wood is 0.9326, a suborbicular, cubic foot weighing 58.12 pounds.

The genus is not known to possess useful properties.

The generic name, from ἕτερος and μῆλον, refers to the fact that this tree differs from the plants of allied genera. It consists of a single species.

HETEROMELES ARBUTIFOLIA.

Tollon. Toyon.

Heteromeles arbutifolia, Roemer, *Fam. Nat. Syn.* iii. 105. — Decaisne, *Nouv. Arch. Mus.* x. 144, t. 9. — Brewer & Watson, *Bot. Cal.* i. 188; ii. 444. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 83. — Greene, *Fl. Francis.* i. 53.

Cratægus arbutifolia, Aiton, *Hort. Kew.* ed. 2, iii. 202 (not Poiret). — Loddiges, *Bot. Cab.* t. 201.

Aronia arbutifolia, Nuttall, *Gen.* i. 306.

Photinia arbutifolia, Lindley, *Trans. Linn. Soc.* xiii. 103; *Bot. Reg.* t. 491; and under t. 1956. — Sprengel, *Syst.* ii. 508. — De Candolle, *Prodr.* ii. 631. — Chamisso & Schlechtendal, *Linnæa*, ii. 542. — Don, *Gen. Syst.* ii. 602. — Spach, *Hist. Vég.* ii. 80. — Hooker & Arnott, *Bot. Voy. Beechey*, 139, 340. — Torrey & Gray, *Fl. N. Am.* i. 473. — Dietrich, *Syn.* iii. 162. — Bentham, *Bot. Voy. Sulphur*, 14; *Pl. Hartweg.* 307. — Torrey, *Emory's Rep.* 140; *Sitgreaves' Rep.* 159; *Pacific R. R. Rep.* iv. 85; *Bot. Mex. Bound. Surv.* 64; *Bot. Wilkes Explor. Exped.* 291. — Bolander, *Proc. Cal. Acad.* iii. 80. — Palmer, *Am. Nat.* xii. 599. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xix. 180 (*Mél. Biol.* ix. 180). — Wenzig, *Linnæa*, xxxviii. 96.

Mespilus arbutifolia, Link, *Enum.* ii. 36.

Photinia salicifolia, Presl, *Epimel. Bot.* 204. — Walpers, *Ann.* iii. 858.

Heteromeles Fremontiana, Decaisne, *Nouv. Arch. Mus.* iii. 144.

A tree, sometimes thirty feet in height, with a straight trunk twelve to eighteen inches in diameter, dividing, a few feet above the surface of the ground, into numerous erect branches which form a handsome narrow or round-topped head; or more often a low much-branched shrub. The bark of the trunk varies from two thirds to one half of an inch in thickness, and is light gray with a generally smooth surface broken by obscure reticulated ridges. The branchlets are at first coated with pale pubescence which gradually disappears, and in their first winter they are dark red and slightly puberulous, ultimately becoming darker and glabrous. The leaves, which appear in early summer with the flowers, are three or four inches long, an inch to an inch and a half broad, and are borne on petioles which vary from half an inch to two thirds of an inch in length and usually remain on the branches during at least two winters. The flowers, which are produced from June to August in compact panicles four to six inches across, are often more or less hidden by young lateral branches which rise above them. The fruit, which is mealy, astringent, and acid, ripens in November and December and remains on the branches until late in the winter.

Heteromeles arbutifolia is distributed through the Californian coast regions from Mendocino County to Lower California;[1] it is most common, and reaches its largest size on the islands off the California coast[2] and extends inland to the foothills of the Sierra Nevada and San Bernardino Mountains. It generally grows in the neighborhood of streams, on dry hills, and especially on their northern slopes, and is often found clinging to the steep cliffs of the coast fully exposed to the sweep of ocean gales; on the island of Santa Catalina, where it is very abundant, it forms groves of considerable extent,[3] and on the foothills of the Sierras, where it ascends to elevations of two thousand feet above the level of the sea, it usually grows as a shrub.

The fruit-covered branches are gathered in large quantities and are used in California for Christmas decorations.[4]

Heteromeles arbutifolia was discovered by Archibald Menzies, the Scotch surgeon who accompanied Vancouver to the northwest coast of America, and, in 1796, introduced it into English gardens.[5]

In winter, when its branches are covered with great clusters of scarlet fruit, whose effectiveness is

[1] T. S. Brandegee, *Proc. Cal. Acad.* ser. 2, iii. 136.

[2] Greene, *Bull. Cal. Acad.* ii. 397; *Pittonia*, i. 77, 88. — T. S. Brandegee, *Proc. Cal. Acad.* ser. 2, i. 209; *Zoë*, i. 136.

[3] T. S. Brandegee, *Zoë*, i. 111.

[4] K. Brandegee, *Zoë*, ii. 349.

[5] Loudon, *Arb. Brit.* ii. 868, f. 619.

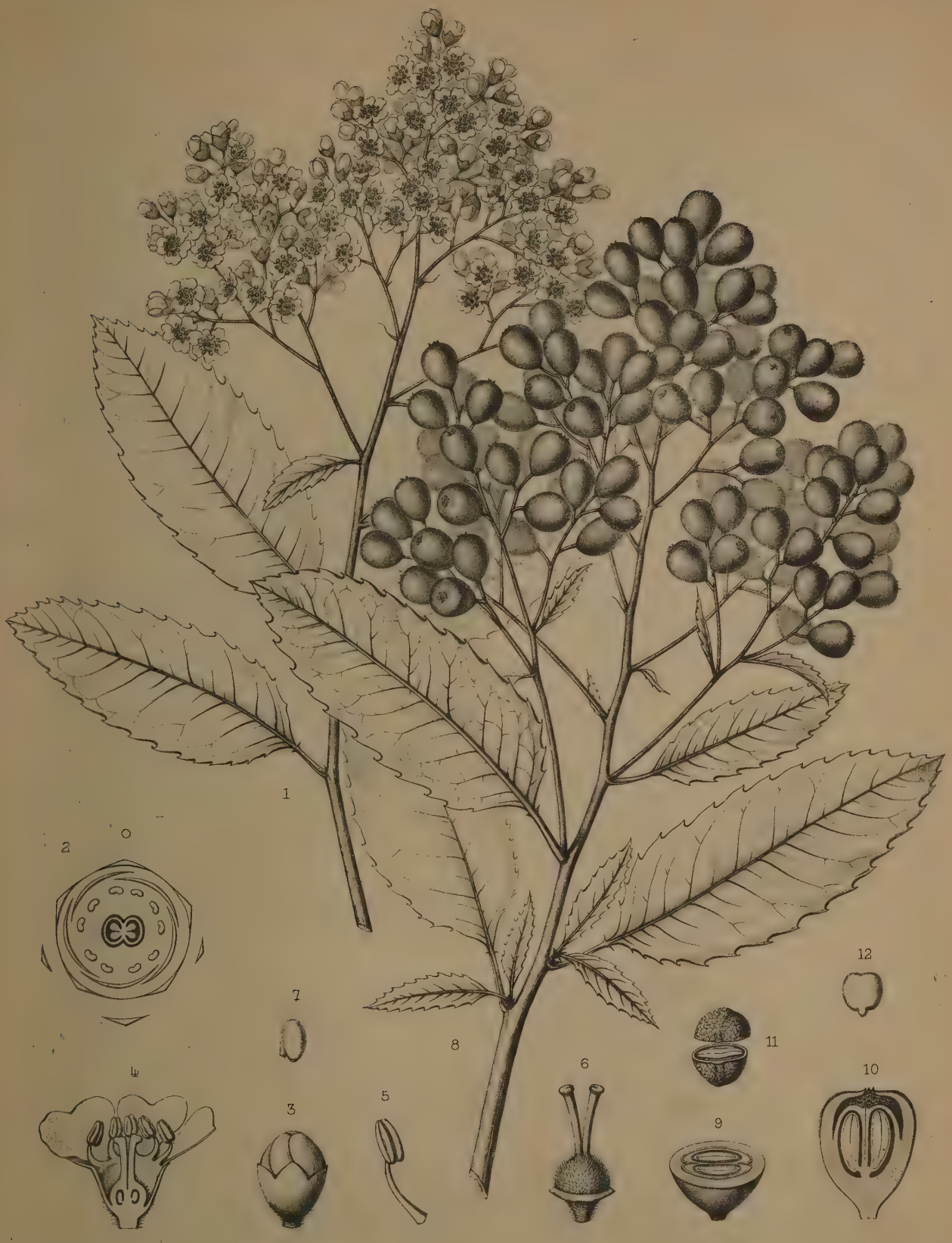
increased by the contrasting color of the ample lustrous dark green foliage, the Tollon[1] is more beautiful perhaps than any other North American tree. It is still too seldom seen in the gardens of California and is rare in those of other parts of the world, although in southern Europe it is perfectly at home and flowers and fruits abundantly.

[1] *Heteromeles arbutifolia* is sometimes also called California Holly and Christmas Berry.

EXPLANATION OF THE PLATE.

PLATE CXCIII. HETEROMELES ARBUTIFOLIA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower-bud, enlarged.
4. Vertical section of a flower, enlarged.
5. A stamen, enlarged.
6. A pistil, enlarged.
7. An ovule, much magnified.
8. A fruiting branch, natural size.
9. Cross section of a fruit, enlarged.
10. Vertical section of a fruit, enlarged.
11. A seed divided transversely, enlarged.
12. An embryo, much magnified.



C.E.Faxon del. Picart fr. sc.

HETEROMELES ARBUTIFOLIA, Rœm.

A.Riocreux direx.t Imp. R. Taneur, Paris

AMELANCHIER.

FLOWERS perfect, regular; calyx 5-lobed, the lobes imbricated in æstivation; petals 5, imbricated in æstivation; stamens usually 20; ovary inferior or partly superior, 5-celled, each cell incompletely divided by a false dissepiment; ovules 2 in each cell, ascending. Fruit a pome. Leaves simple, alternate, deciduous.

Amelanchier, Medicus, *Phil. Bot.* i. 135, 155. — Lindley, *Trans. Linn. Soc.* xiii. 100. — Meisner, *Gen.* 106. — Endlicher, *Gen.* 1237. — Bentham & Hooker, *Gen.* i. 628 (excl. *Peraphyllum*). — Baillon, *Hist. Pl.* i. 477 (excl. *Peraphyllum*).

Aronia, Persoon, *Syn.* ii. 39 (in part).

Trees or shrubs, with scaly bark, slender terete branchlets, acute buds with imbricated scales, those of the inner rows accrescent and bright colored, and fibrous roots. Leaves alternate, conduplicate in vernation, simple, entire or serrate, penniveined, often lanate, petiolate, deciduous; stipules subulate, elongated, caducous. Flowers in erect or nodding racemes, their pedicels slender, bibracteolate, developed from the axils of lanceolate acuminate deciduous bracts. Calyx-tube campanulate or urceolate, the lobes acute or subulate, recurved, persistent. Disk lining the tube of the calyx, green, entire or crenulate, nectariferous. Petals white, obovate-oblong, spatulate or ligulate, rounded, acute or truncate at the apex, gradually contracted below into short slender claws, inserted on the thickened margin of the disk, spreading. Stamens usually twenty, inserted with the petals in three rows, those of the outer row of ten parapetalous, those of the other rows alternate with them and with each other; filaments subulate, free, persistent on the fruit; anthers oblong, attached on the back near the middle, introrse, two-celled, the cells opening longitudinally. Ovary more or less adnate to the calyx-tube, glabrous or puberulous above, two to five-celled, each cell more or less divided after the fecundation of the ovules into two compartments by the development of a false partition from the back; styles two to five, connate below, spreading and dilated above into broad truncate stigmas; ovules two in each cell, erect, anatropous, the micropyle inferior. Fruit subglobose or pyriform, open at the summit, the cavity surrounded by the lobes of the calyx and the remnants of the filaments; mesocarp sweet, rather juicy, red or dark purple; endocarp membranaceous or cartilaginous, the carpels free or connate, glabrous or villose at the apex. Seeds ten or often five by the abortion of one of the ovules in each cell, ovate-elliptical, not rarely subuncinate at the base, destitute of albumen; testa coriaceous, dark chestnut-brown, mucilaginous. Embryo filling the cavity of the seed; cotyledons plano-convex, the radicle inferior.

Amelanchier is widely distributed through the boreal and temperate portions of eastern and the mountainous regions of western North America, and occurs in Japan and central China, in Asia Minor, the Caucasus, southern Europe, and northern Africa. Five or six species are distinguished; one is European,[1] north African, and Anatolian; a second inhabits the Orient;[2] and a third, perhaps not distinct from the arborescent species of eastern America, is found in the forests of Japan and of central

[1] *Amelanchier Amelanchier.*

Mespilus Amelanchier, Linnæus, *Spec.* 478.

Sorbus Amelanchier, Crantz, *Stirp. Austr.* ii. 53.

Pyrus Amelanchier, Linnæus f. *Syst.* ed. 13, Suppl. 256. — Willdenow, *Spec.* ii. pt. ii. 1014.

Cratægus rotundifolia, Lamarck, *Dict.* i. 84.

Amelanchier vulgaris, Moench, *Meth.* 682. — De Candolle, *Prodr.* ii. 632. — Boissier, *Fl. Orient.* ii. 667.

Amelanchier rotundifolia, Du Mont de Courset, *Bot. Cult.* ed. 2, v. 459.

Cratægus Amelanchier, De Candolle, *Fl. Franc.* iv. 432.

Aronia rotundifolia, Persoon, *Syn.* ii. 39.

Amelanchier rotundifolia, Decaisne, *Nouv. Arch. Mus.* x. 134.

[2] *Amelanchier parviflora*, Boissier, *Diag.* iii. 9; *Fl. Orient.* ii. 668.

China,[1] while two belong to the flora of eastern and one to that of western America. Two of the American species attain the size of small trees; the third[2] is a shrub of the northern and alpine parts of eastern America. The Old World species are shrubs.

The fruit of all the species is more or less succulent and edible, and the wood produced by the American arborescent species is strong, hard, and close-grained. The large white flowers, appearing before or coetaneous with the leaves, give the different species great beauty in very early spring, and make them desirable garden plants.

The American species of Amelanchier do not suffer seriously from the attacks of insects,[3] although they are subject to many of the fungal diseases which affect Pyrus and Cratægus.[4]

The generic name is derived from Amelancier, the popular name of the European species in Savoy.

[1] *Amelanchier Asiatica*, Walpers, *Rep.* ii. 55. — Roemer, *Fam. Nat. Syn.* iii. 144. — Koch, *Dendr.* i. 180.

Aronia Asiatica, Siebold & Zuccarini, *Fl. Jap.* i. 87, t. 42.

Amelanchier Canadensis, var. *Japonica*, Miquel, *Prol. Fl. Jap.* 229. — Franchet & Savatier, *Enum. Pl. Jap.* i. 142. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xix. 175 (*Mél. Biol.* ix. 174).

[2] *Amelanchier oligocarpa*, Roemer, *Fam. Nat. Syn.* iii. 145. — Watson, *Garden and Forest*, i. 245, f. 41. — Watson & Coulter, *Gray's Man.* ed. 6, 167.

Mespilus Canadensis, var. *oligocarpa*, Michaux, *Fl. Bor.-Am.* i. 291.

Amelanchier? sanguinea, De Candolle, *Prodr.* ii. 633 (in part).

Amelanchier Canadensis, var. *oligocarpa*, Torrey & Gray, *Fl. N. Am.* i. 474. — Torrey, *Fl. N. Y.* i. 226. — Gray, *Man.* 131.

Amelanchier sanguinea, Decaisne, *Nouv. Arch. Mus.* x. 136 (not De Candolle nor Lindley).

[3] The same insects which injure Pyrus in North America are also found on the different species of Amelanchier; and Leaf-miners like *Nepticula amelanchierella*, Clemens, and *Ornix quadripunctella*, Clemens, may be peculiar to them.

[4] A striking fungus attacks the leaves and young branches of *Amelanchier Canadensis* in the east, and of *Amelanchier alnifolia* in the west, covering them at first with an olive-colored down which afterwards changes to a black crenulated surface. Many leaves on certain branches are attacked simultaneously, and the so-called bird's-nest distortions are produced. This fungus, which belongs to the order *Pyrenomycetes*, was first called *Sphæria Collinsii* by Schweinitz, and by other authors has been referred to Dimerosporium, Lasiosphæria, and Plowrightia.

CONSPECTUS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Leaves ovate to ovate-oblong or oblong to broadly elliptical or suborbicular, acute or rounded at the apex, cordate or rounded at the base . . . . . 1. A. CANADENSIS.

Leaves broadly orbicular, obtuse, or rarely acute . . . . . 2. A. ALNIFOLIA.

AMELANCHIER CANADENSIS.

Shad Bush. Service Berry.

LEAVES ovate to ovate-oblong, acute, cordate or rounded at the base.

Amelanchier Canadensis, Medicus, *Gesch. Bot.* 79. — Darlington, *Fl. Cestr.* ed. 3, 86. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 68. — Koch, *Dendr.* i. 180. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xix. 176 (*Mél. Biol.* ix. 174). — Emerson, *Trees Mass.* ed. 2, ii. 503, t. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 84. — Watson & Coulter, *Gray's Man.* ed. 6, 166.

Mespilus Canadensis, Linnæus, *Spec.* 478. — Miller, *Dict.* ed. 8, No. 6. — Du Roi, *Harbk. Baumz.* i. 416. — Walter, *Fl. Car.* 148.

Pyrus Botryapium, Linnæus f. *Syst.* ed. 13, Suppl. 255. — Wangenheim, *Nordam. Holz.* 90, t. 28, f. 65. — Ehrhart, *Beitr.* i. 183; ii. 68. — Willdenow, *Berl. Baumz.* 258; *Spec.* ii. pt. ii. 1013; *Enum.* 525. — Aiton, *Hort. Kew.* ed. 2, iii. 207. — Pursh, *Fl. Am. Sept.* i. 339. — Bigelow, *Fl. Boston.* 120. — Hayne, *Dendr. Fl.* 83. — Guimpel, Otto & Hayne, *Abbild. Holz.* 100, t. 79. — Sprengel, *Syst.* ii. 509. — Audubon, *Birds*, t. 60.

Cratægus racemosa, Lamarck, *Dict.* i. 84. — Desfontaines, *Hist. Arb.* ii. 148. — *Nouveau Duhamel*, iv. 133. — Poiret, *Lam. Dict.* Suppl. i. 292.

Mespilus nivea, Marshall, *Arbust. Am.* 90.

Amelanchier Canadensis, var. **prunifolia**, Castiglioni, *Viag. negli Stati Uniti*, ii. 293.

Mespilus Amelanchier, Castiglioni, *Viag. negli Stati Uniti*, ii. 293 (not Linnæus).

Mespilus Canadensis, var. **cordata**, Michaux, *Fl. Bor.-Am.* i. 291.

Amelanchier Botryapium, Borkhausen, *Handb. Forstbot.* ii. 1260. — Du Mont de Courset, *Bot. Cult.* v. 458. — Lindley, *Trans. Linn. Soc.* xiii. 100. — De Candolle, *Prodr.* ii. 632. — Hooker, *Fl. Bor.-Am.* i. 202. — Don, *Gen. Syst.* ii. 604. — Spach, *Hist. Vég.* ii. 84. — Roemer, *Fam. Nat. Syn.* iii. 145. — Wenzig, *Linnæa*, xxxviii. 110. — Decaisne, *Nouv. Arch. Mus.* x. 135.

Aronia Botryapium, Persoon, *Syn.* ii. 39. — Nuttall, *Gen.* i. 306. — Elliott, *Sk.* i. 557. — Darlington, *Fl. Cestr.* 63.

Mespilus arborea, Michaux f. *Hist. Arb. Am.* iii. 68, t. 11. — W. P. C. Barton, *Fl. Phil. Prodr.* 55.

Aronia arborea, W. P. C. Barton, *Compend. Fl. Phil.* i. 228.

Amelanchier sanguinea, Lindley, *Bot. Reg.* t. 1171 (not De Candolle).

Aronia cordata, Rafinesque, *Med. Fl.* ii. 196.

Amelanchier ovalis, Hooker, *Fl. Bor.-Am.* i. 202 (in part).

Amelanchier Canadensis, var. **Botryapium**, Torrey & Gray, *Fl. N. Am.* i. 473. — Walpers, *Rep.* ii. 55. — Dietrich, *Syn.* iii. 158. — Torrey, *Fl. N. Y.* i. 225. — Chapman, *Fl.* 129.

Pyrus Bartramiana, Tausch, *Regensb. Flora*, 1838, pt. ii. 715.

Pyrus Wangenheimiana, Tausch, *Regensb. Flora*, 1838, pt. ii. 715.

Amelanchier Bartramiana, Roemer, *Fam. Nat. Syn.* iii. 145.

Amelanchier Wangenheimiana, Roemer, *Fam. Nat. Syn.* iii. 146.

A tree, sometimes forty to fifty feet in height, with a tall trunk twelve to eighteen inches in diameter, and small spreading branches which form a narrow oblong round-topped head. The bark of the trunk is from a quarter to half an inch in thickness, pale red-brown, and divided by shallow fissures into narrow longitudinal ridges, the surface of which is broken into small square persistent scales. The branchlets are slender and at first bright green and glabrous or slightly puberulous, but are dark red and marked with many minute pale lenticels in their first winter, and later become dark brown or red-brown. The winter-buds are a quarter of an inch long and covered with pale chestnut-brown ovate apiculate slightly pubescent scales, scarious on the margins and obscurely keeled on the back; the scales of the inner ranks are lanceolate, acute, bright red above the middle, ciliate with silky hairs, and sometimes an inch long when fully grown, and leave when falling narrow ring-like scars which mark the base of the branchlets during two or three years. The leaves are ovate to ovate-oblong, acute or often taper-pointed at the apex, cordate or rounded at the base, and finely serrate with straight or incurved rigid subulate teeth; when they unfold they are dark red-brown and pilose on both surfaces with scattered deciduous white hairs, and at maturity they are thick and firm in texture, glabrous,

dark green and dull on the upper surface, pale on the lower surface, three or four inches long and an inch to an inch and a half broad, with prominent midribs grooved on the upper side and slender veins, and are borne on slender channeled petioles which vary from half an inch to an inch in length. The stipules are narrowly lanceolate, membranaceous, pubescent, at first pink but ultimately brown, and early deciduous. The leaves turn bright clear yellow in the autumn before falling. The flowers, which appear from the end of March at the south to the end of May at the north when the leaves are grown to nearly one third of their size, are produced in erect or nodding glabrous racemes three or four inches long, and are borne on slender pedicels half an inch to an inch in length, furnished with two lanceolate pubescent pink caducous bractlets, and developed from the axils of lanceolate bright-colored bracts which fall before the expansion of the flowers. The calyx is campanulate, with lanceolate acute lobes, villose on the inner surface, twice the length of the tube, and rather longer than the stamens and styles. The petals are strap-shaped or slightly obovate, rounded or acute at the apex, gradually contracted at the base, thin, pure white, half an inch to nearly an inch in length, and from a quarter to half an inch in width. The ovaries are glabrous. The fruit, which ripens in early summer, is sweet and edible; it is depressed-globular, from a third to half an inch broad, and borne on elongated slender stems conspicuously marked by the scars left by the falling of the bractlets; when first fully grown it is bright red, but when ripe becomes dark purple and is covered with a slight glaucous bloom. The seeds are an eighth of an inch long, with a dark red-brown opaque coat.

Amelanchier Canadensis is distributed from Newfoundland through the maritime provinces of Canada, where it is common, and westward along the northern shores of the Great Lakes,[1] and in the United States ranges southward to northern Florida and westward to Minnesota, eastern Nebraska,[2] eastern Kansas, Louisiana, and southern Arkansas.

Amelanchier Canadensis grows in rich soil in upland woods with Oaks, Hickories, Sugar Maples, and Birches; it is abundant in all the northern parts of the country and on the Alleghany Mountains, where, in North Carolina and Tennessee, it reaches its greatest size. In the coast region of the Atlantic Gulf states it is represented only by a low shrubby form, while west of the Alleghany Mountains it is common in all the elevated regions but does not extend into the river-bottoms, and is more abundant at the north than at the south.

The wood of *Amelanchier Canadensis* is heavy, exceedingly hard, strong, and close-grained, with a satiny surface susceptible of receiving a good polish; it is dark brown often tinged with red, with thick lighter colored sapwood composed of forty or fifty layers of annual growth, and contains numerous obscure medullary rays. The specific gravity of the absolutely dry wood is 0.7838, a cubic foot weighing 48.85 pounds. It is occasionally used for the handles of tools and other small implements.

Amelanchier Canadensis varies considerably in the form of its leaves and in the character of the pubescence which sometimes covers them, in the size of its flowers and fruit, and in its habit and stature. The most distinct of these forms is *Amelanchier Canadensis*, var. *obovalis*.[3] This is a tree sometimes twenty-five or thirty feet in height, with a single straight stem or often with a cluster of spreading stems springing from the ground and forming a broad tall bush. The leaves are oblong or broadly elliptical, acute or rounded at the apex, rounded or subcordate at the base, remotely serrate

[1] Brunet, *Cat. Vég. Lig. Can.* 27. — Bell, *Rep. Geolog. Surv. Can.* 1867–69, Appendix 9 (*Pl. Manitoulin Islands*). — Macoun, *Cat. Can. Pl.* i. 148.

[2] Bessey, *Bull. Exper. Stat. Nebraska*, iv. art. iv. 20.

[3] *Amelanchier Canadensis*, var. *obovalis*.

Mespilus Canadensis, var. *obovalis*, Michaux, *Fl. Bor.-Am.* i. 291.

Pyrus sanguinea, Pursh, *Fl. Am. Sept.* i. 340 (in part). — Sprengel, *Syst.* ii. 509.

Pyrus ovalis, Bigelow, *Fl. Boston.* ed. 2, 195 (not Willdenow).

Aronia ovalis, Torrey, *Fl. U. S.* 479.

Amelanchier intermedia, Spach, *Hist. Vég.* ii. 85. — Wenzig, *Linnæa*, xxxviii. 112.

Amelanchier Canadensis, var. *oblongifolia*, Torrey & Gray, *Fl. N. Am.* i. 473. — Walpers, *Rep.* ii. 55. — Dietrich, *Syn.* iii. 158. — Torrey, *Fl. N. Y.* i. 225; *Nicollet's Rep.* 149. — Emerson, *Trees Mass.* ed. 2, ii. 504, t. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 84. — Watson & Coulter, *Gray's Man.* ed. 6, 167.

Amelanchier oblongifolia, Roemer, *Fam. Nat. Syn.* iii. 147.

Amelanchier spicata, Decaisne, *Nouv. Arch. Mus.* x. 135, t. 9, f. 5 (not Lamarck).

or sometimes nearly entire below the middle, coated at first on the lower surface with thick white tomentum, and at maturity pale and more or less pubescent on the lower surface. The flowers, which are produced in shorter racemes on hairy pedicels, are smaller, with pubescent calyces, their lobes being densely tomentose on the inner surface, and narrower strap-shaped petals usually less than half an inch long. This variety is found in Nova Scotia and New Brunswick, where, however, it is not common, and is abundant in Quebec and Ontario, extending northward to the valley of the Mackenzie River in latitude 65°;[1] it is common in the northeastern states, ranging southward along the Alleghany Mountains to Virginia and westward to Minnesota and Missouri, and occasionally occurs, much reduced in size, in the southern coast region from Bluffton, South Carolina, to the shores of the Bay of Mobile.

Amelanchier Canadensis, var. *obovalis*, grows usually on the borders of streams and swamps in low wet soil, and sometimes on high rocky slopes and ridges, where it is often a small shrub producing fruit when only a foot or two high. In the situations which it selects, and in the shape and covering of its leaves, it is usually very distinct from the upland form, but the two are connected by intermediate forms growing in intermediate situations which make it difficult to find constant characters upon which to establish a second species.

The fruit of the tomentose form is rather more juicy and of better flavor than that of the upland tree; and of late years American pomologists have paid some attention to the cultivation and improvement of a large-fruited variety originally obtained from Iowa, Minnesota, and Manitoba.[2]

Amelanchier Canadensis, var. *spicata*,[3] is a variety with broader obovate sometimes suborbicular leaves which is common in the northern states, where it usually grows as a low shrub, but occasionally rises to a height of fifteen or twenty feet.

The earliest account[4] of *Amelanchier Canadensis* is that of Clayton,[5] who also distinguished the tomentose variety.[6] It was first cultivated in Europe in 1746 by the Duke of Argyll.[7]

Amelanchier Canadensis is a beautiful object in early spring when its large white flowers unfold with the red or with the silvery white leaves of the different varieties, and its beauty at this time is heightened by its brilliant silky bud-scales and bracts. As a fruit-tree, although the birds devour the fruit as fast as it ripens, it deserves more attention than it has yet received.

[1] Richardson, *Arctic Searching Exped.* ii. 294. — Macoun, *Cat. Can. Pl.* i. 149.

[2] *Am. Agric.* xxx. 144. — *Rep. Iowa Hort. Soc.* xii. 203. — *Gardeners' Monthly*, xx. 141, 186, 306.

[3] *Amelanchier Canadensis*, var. *spicata*.

Cratægus spicata, Lamarck, *Dict.* i. 84. — Desfontaines, *Hist. Arb.* ii. 148. — *Nouveau Duhamel*, iv. 132. — Poiret, *Lam. Dict.* Suppl. i. 192.

Pyrus ovalis, Willdenow, *Berl. Baumz.* 259; *Spec.* ii. pt. ii. 1014. — Pursh, *Fl. Am. Sept.* i. 340.

Mespilus Canadensis, var. *rotundifolia*, Michaux, *Fl. Bor.-Am.* i. 291.

Amelanchier ovalis, Borkhausen, *Handb. Forstbot.* ii. 1259. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 459. — Lindley, *Trans. Linn. Soc.* xiii. 100. — De Candolle, *Prodr.* ii. 635. — Hooker, *Fl. Bor.-Am.* i. 202 (excl. var.). — Don, *Gen. Syst.* ii. 604 (excl. var.). — Spach, *Hist. Vég.* ii. 85. — Loudon, *Arb. Brit.* ii. 876, f. 632.

Aronia ovalis, Persoon, *Syn.* ii. 40. — Elliott, *Sk.* i. 558.

Amelanchier Canadensis, var. *rotundifolia*, Torrey & Gray, *Fl. N. Am.* i. 473. — Walpers, *Rep.* ii. 55. — Dietrich, *Syn.* 158. — Torrey, *Fl. N. Y.* i. 225. — Chapman, *Fl.* 129. — Watson & Coulter, *Gray's Man.* ed. 6, 167.

Amelanchier rotundifolia, Roemer, *Fam. Nat. Syn.* iii. 146 (not Du Mont de Courset).

[4] It was probably one of the forms of *Amelanchier Canadensis* which John Mason, writing of Newfoundland in 1620, calls a Peare in this passage: "The Countrie fruites wild, are cherries small, whole groaues of them, Filberds good, a small pleasant fruite, called a Peare, Damaske Roses single very sweet, excellēt Strawberries, and Hartleberries with aboundance of Rasberries, and Gooseberries somewhat better than ours in *England*, all which replanted would be much inlarged." (*A Brief Discourse of the Newfoundland* [*Royal Letters, Charters, and Tracts relating to the Colonization of New Scotland*, 1621–1638].)

[5] *Mespilus inermis, foliis subtus glabris obverse ovatis, Fl. Virgin.* 54. — Duhamel, *Traité des Arbres*, ii. 15.

[6] *Mespilus inermis, folio ovato oblongis, serratis, subtus tomentosis, Fl. Virgin.* 55.

[7] Aiton, *Hort. Kew.* ii. 173. — Loudon, *Arb. Brit.* ii. 874, f. 627–629, t.

EXPLANATION OF THE PLATES.

Plate CXCIV. Amelanchier Canadensis.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. Vertical section of a flower, enlarged.
4. Front and rear views of a stamen, enlarged.
5. Cross section of an ovary, enlarged.
6. An ovule, much magnified.
7. A fruiting branch, natural size.
8. Vertical section of a fruit, enlarged.
9. Cross section of a fruit, enlarged.
10. A seed, enlarged.
11. An embryo, much magnified.
12. The end of a winter branchlet, natural size.

Plate CXCV. Amelanchier Canadensis, *var.* obovalis.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A fruiting branch, natural size.
4. A fruit divided transversely, enlarged.
5. A seed, enlarged.
6. An embryo, much magnified.

C. E. Faxon del. Picart sc.

AMELANCHIER CANADENSIS, Torr. & Gray.

A. Riocreux direx.t Imp. R. Taneur, Paris

C.E. Faxon del. Picart sc.

AMELANCHIER CANADENSIS, Var. OBOVALIS, Sarg.

A. Riocreux direx.t Imp. R. Taneur, Paris.

AMELANCHIER ALNIFOLIA.

Service Berry.

Leaves broadly ovate to orbicular, obtuse or rarely acute.

Amelanchier alnifolia, Nuttall, *Jour. Phil. Acad.* vii. 22. — Roemer, *Fam. Nat. Syn.* iii. 147. — Cooper, *Am. Nat.* iii. 407. — Wenzig, *Linnæa*, xxxviii. 113. — Decaisne, *Nouv. Arch. Mus.* x. 135. — Brewer & Watson, *Bot. Cal.* i. 190. — Watson & Coulter, *Gray's Man.* ed. 6, 167. — Greene, *Fl. Francis.* i. 52.

Pyrus sanguinea, Pursh, *Fl. Am. Sept.* i. 340 (in part).

Aronia alnifolia, Nuttall, *Gen.* i. 306.

Pyrus alnifolia, Sprengel, *Syst.* ii. 509.

Amelanchier ovalis, var. **semiintegrifolia**, Hooker, *Fl. Bor.-Am.* i. 202. — Don, *Gen. Syst.* ii. 604,

Amelanchier florida, Lindley, *Bot. Reg.* t. 1589. — Spach, *Hist. Vég.* ii. 86. — Walpers, *Rep.* ii. 55. — Loudon, *Arb. Brit.* ii. 876, f. 633, 634. — Roemer, *Fam. Nat. Syn.* iii. 144. — Decaisne, *Nouv. Arch. Mus.* x. 135.

Amelanchier Canadensis, var. **alnifolia**, Torrey & Gray, *Fl. N. Am.* i. 473. — Walpers, *Rep.* ii. 55. — Dietrich, *Syn.* iii. 158. — Torrey, *Pacific R. R. Rep.* iv. 85; *Bot. Mex. Bound. Surv.* 64; *Bot. Wilkes Explor. Exped.* 291. — Hooker, *Lond. Jour. Bot.* vi. 220. — Gray, *Man.* 130. — Newberry, *Pacific R. R. Rep.* vi. 73. — Cooper, *Pacific R. R. Rep.* xii. pt. ii. 30. — Watson, *King's Rep.* v. 92.

Amelanchier Canadensis, var. **pumila**, Torrey & Gray, *Fl. N. Am.* i. 474. — Walpers, *Rep.* ii. 55. — Dietrich, *Syn.* iii. 158.

Amelanchier pumila, Roemer, *Fam. Nat. Syn.* iii. 145.

Amelanchier Canadensis, var. **oblongifolia**, Bentham, *Pl. Hartweg.* 309 (not Torrey & Gray).

Amelanchier diversifolia, var. **alnifolia**, Torrey, *Frémont's Rep.* 89.

Amelanchier Canadensis, Anderson, *Cat. Pl. Nev.* 120 (not Medicus).

? Amelanchier glabra, Greene, *Fl. Francis.* i. 52.

? Amelanchier pallida, Greene, *Fl. Francis.* i. 53.

A tree, occasionally forty feet in height, with a single straight trunk six to ten inches in diameter, or more often with a cluster of slender stems rising from the ground; or usually a shrub only a foot or two in height. The bark of the trunk is an eighth of an inch thick, smooth or slightly fissured, and light brown somewhat tinged with red. The branches are green at first and glabrous, pilose with long pale hairs or coated with pubescence, and in their first winter are stout, bright red or plum-color, glabrous or rarely puberulous, and more or less marked by small pale lenticels. The winter-buds are acute, a quarter of an inch long, and covered with chestnut-brown glabrous or occasionally pilose scales; the scales of the inner ranks at maturity are ovate, acute, brightly colored, covered with pale silky hairs, and from a half to three quarters of an inch in length. The leaves are broadly ovate to orbicular or occasionally oblong-ovate, rounded or rarely acute at the apex, rounded or subcordate at the base, and sharply and coarsely serrate above the middle, with incurved rigid teeth; when they unfold they are coated on the lower surface with thick pale tomentum, and are often pilose on the upper surface; but they soon become glabrous, and at maturity are membranaceous to subcoriaceous, dark green above and pale or sometimes rufous below, or, when the plants grow in the dry climate of the interior, gray-green on both surfaces and often puberulous below; they are an inch to an inch and a half in length and in breadth, with slender midribs and veins, and are borne on slender petioles half an inch long. The stipules are linear, acute, red-brown, sometimes an inch in length, and caducous. The flowers, which appear from April on the shores of Puget Sound to the middle of June on the high mountains of Montana, are produced in erect glabrous or pubescent racemes an inch to an inch and a half in length on short pedicels furnished near the middle with linear acute colored bractlets which in falling leave conspicuous scars. The calyx is cup-shaped and glabrous, pilose or pubescent on the outer surface, with linear acute lobes glabrous or coated with pubescence on the inner surface. The petals are narrowly oblong to obovate, rounded or acute at the apex, and from a quarter of an inch to an inch in length. The ovaries are pubescent or puberulous. The fruit ripens from June to September, and is sweet and juicy; it is subglobose, dark blue or almost black, with a glaucous bloom, and from half an

inch to nearly an inch in diameter. The seeds are an eighth of an inch long, with a lustrous red-brown coat.[1]

Amelanchier alnifolia is distributed from the valley of the Yukon River in latitude 62° 45′ north,[2] southward through the coast ranges of northeastern America and on the mountain ranges of the western and interior parts of the continent, extending in California to the southern boundary of the state, and eastward through British Columbia, the Saskatchewan, and Manitoba, to the western shores of Lake Superior,[3] and to northern Michigan, Nebraska,[4] and the Rocky Mountains of Colorado[5] and New Mexico.[6]

The wood of *Amelanchier alnifolia* is heavy, hard, and close-grained; it is light brown and contains numerous obscure medullary rays. The specific gravity of the absolutely dry wood is 0.8262, a cubic foot weighing 51.55 pounds.

The nutritious and abundant fruit of the Service Berry is an important article of food with the Indians of western America, who gather and dry it in large quantities.[7]

Amelanchier alnifolia attains its largest size and occasionally assumes the habit of a tree on the islands and rich bottom-lands of the lower Columbia River and on the small prairies which occur in Washington in the neighborhood of Puget Sound, where it grows in gravelly soil near the borders of small ponds, and often forms thickets of considerable extent, or is associated with the Oregon Hawthorn, the Crab-apple, and the Choke Cherry. In the interior it is confined to high elevations, in California frequently ascending ten thousand feet above the level of the ocean, sometimes near the borders of streams or alpine meadows, or often on high hillsides where, as a low shrub, it forms thickets which cover areas several hundred acres in extent.

Amelanchier alnifolia was noticed early in this century by the party of explorers who, under the leadership of Lewis and Clark, first crossed North America;[8] and it was introduced into cultivation by David Douglas who, in 1826, sent seeds to the London Horticultural Society. In the Arnold Arboretum it produces fruit every year.

[1] In the different parts of the immense territory over which it is distributed *Amelanchier alnifolia* varies not only in size and habit, but in the texture and color of the leaves, in the amount and character of the pubescence of the calyx, and in the size of the flowers; at high elevations in the dry interior its foliage, like that of many plants in these regions, is pale green on both sides, and the bark of the branches and stems is much lighter than on plants which have grown in the more humid climate of the coast. The extreme forms of this species, however, are connected by intermediate forms, and it is not probable that western America contains more than a single species of Amelanchier, and this, at the extreme eastern limits of its range, is not always easily distinguished from some of the broad-leaved forms of *Amelanchier Canadensis* of the eastern states.

[2] Macoun, *Cat. Can. Pl.* i. 148.

[3] Macoun, *l. c.* 522.

[4] Bessey, *Bull. Agric. Exper. Stat. Nebraska*, iv. art. iv. 20.

[5] Coulter, *Man. Rocky Mt. Bot.* 89.

[6] Gray, *Mem. Am. Acad.* n. ser. iv. 42 (*Pl. Fendler.*).

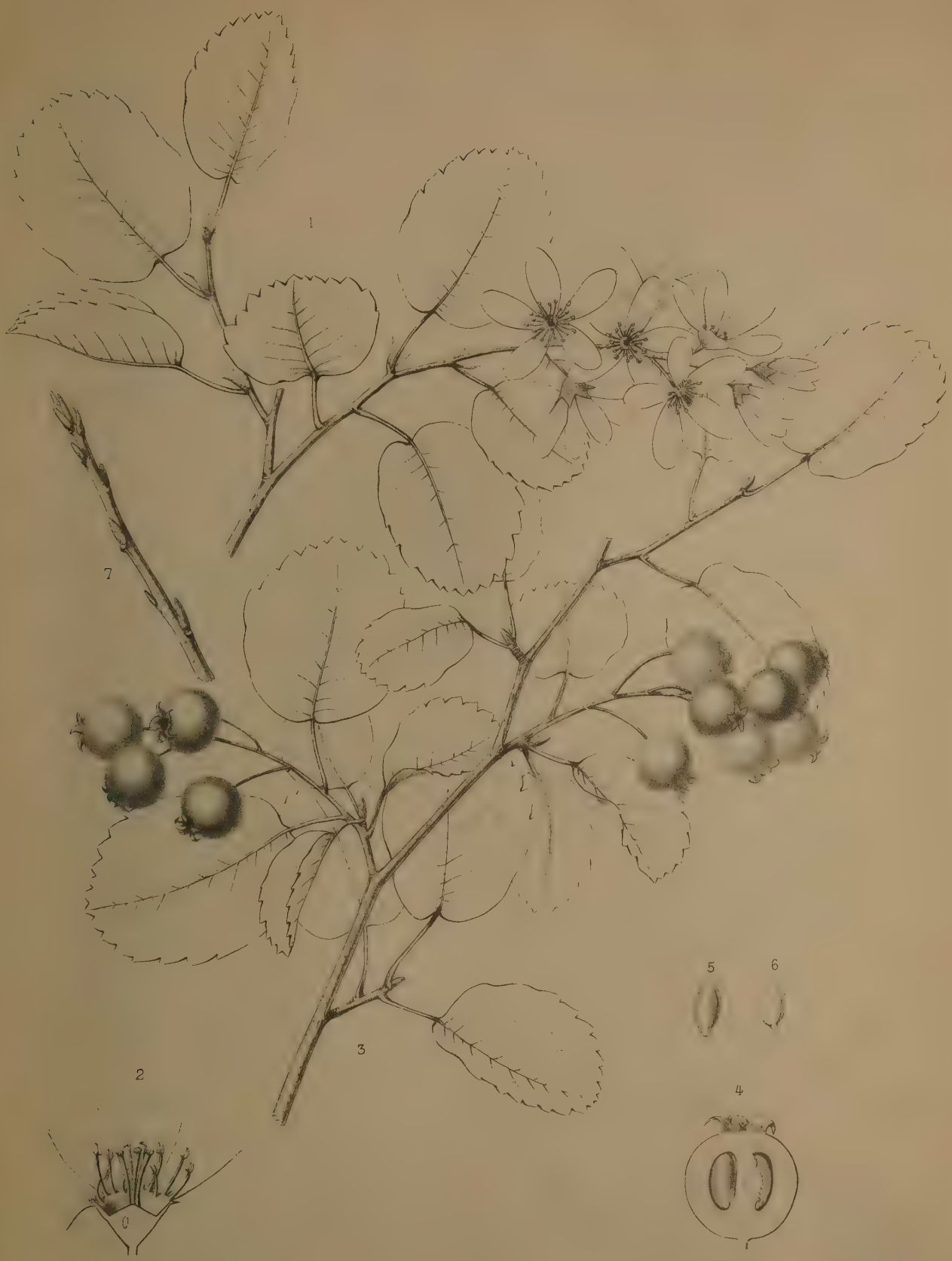
[7] "In a great number of localities service-berries are stored for winter use by the Indians. They are gathered where most abundant, crushed and made into a paste which is spread out on bark or stones in the sun until it is thoroughly dried. It is then put in sacks, and during the winter serves to give variety to their diet which otherwise consists of flesh or dried fish." (Newberry, *Food and Fibre Plants of the North American Indians, Popular Science Monthly*, xxxii. 43. See, also, R. Brown (Campst.), *Trans. Bot. Soc. Edinburgh*, ix. 384.)

[8] *History of the Expedition under the Command of Captains Lewis and Clark to the Sources of the Missouri, thence across the Rocky Mountains and down the River Columbia to the Pacific Ocean*, ii. 505.

EXPLANATION OF THE PLATE.

PLATE CXCVI. AMELANCHIER ALNIFOLIA.

1. A flowering branch, natural size.
2. Vertical section of a flower, the ends of the petals removed, enlarged.
3. A fruiting branch, natural size.
4. Vertical section of a fruit, enlarged.
5. A seed, natural size.
6. An embryo, much magnified.
7. A winter branchlet, natural size.



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AMELANCHIER ALNIFOLIA, Nutt.

A Riocreux direx.t Imp R Taneur, Paris

LYONOTHAMNUS.

FLOWERS perfect; calyx 5-lobed, the lobes imbricated in æstivation, persistent; petals 5, imbricated in æstivation; stamens 15; ovaries 2, 1-celled; ovules 4 in each cell, suspended. Fruit follicular. Leaves opposite, simple or pinnately divided, persistent.

Lyonothamnus, Gray, *Proc. Am. Acad.* ser. 2, xii. 291.

A tree or shrub, with scaly bark exfoliating in long strips, stout terete pubescent ultimately glabrous branchlets, and scaly buds. Leaves opposite, long-petiolate, lanceolate, acuminate, rounded or wedge-shaped at the base, entire or finely crenulate-serrate or serrulate-lobulate below the middle, or on the same branch irregularly pinnately parted into three to eight linear lanceolate remote lobulate segments, coriaceous, transversely many-veined, dark green on the upper surface, paler and more or less coated with pubescence on the lower, persistent; stipules lanceolate, acute, minute, caducous. Flowers on slender pedicels in broad ample compound terminal pubescent cymes. Bracts and bractlets acute, minute, persistent. Calyx-tube hemispherical, one to three-bracteolate, tomentose on the outer surface, the lobes nearly triangular, slightly keeled, apiculate, persistent. Disk lining the calyx-tube, lanate, the slightly thickened margin ten-lobed. Petals five, orbicular, sessile, white. Stamens fifteen, inserted with the petals on the margin of the disk in pairs opposite the petals and singly opposite the sepals; filaments subulate, incurved, as long as the petals; anthers oblong, attached on the back below the middle, introrse, two-celled, the cells opening longitudinally. Pistils two, inserted in the bottom of the calyx-tube; ovaries ovate, flattened on the inner surface by mutual pressure, glandular-setulose, contracted into thick spreading styles; stigmas capitate, truncate; ovules four in each cell, oblong, suspended, anatropous; micropyle superior, the raphe ventral. Fruit composed of two woody ovate glandular four-seeded follicles, dehiscent on the ventral and partially dehiscent on the dorsal suture. Seeds ovate-oblong, pointed at both ends; albumen thin; testa light brown, thin, and membranaceous; hilum orbicular, apical, the raphe broad and wing-like. Cotyledons oblong-acuminate, twice the length of the straight radicle directed towards the hilum.

The wood of Lyonothamnus is very heavy, hard, and close-grained, with a satiny surface susceptible of receiving a good polish. It contains numerous thin medullary rays, the layers of annual growth being hardly distinguishable, and is bright clear red faintly tinged with orange. The specific gravity of the absolutely dry wood is 0.8029, a cubic foot weighing 50.05 pounds.[1]

Lyonothamnus was named in honor of William S. Lyon, who discovered it in July, 1884,[2] on the island of Santa Catalina, California. It is represented by a single species.

[1] *Garden and Forest*, iii. 344.

[2] William Scrugham Lyon, forester of the California State Board of Forestry, was born at White Plains, New York, in November, 1852, and educated at the College of the State of New York and at the Massachusetts Agricultural College. The acquaintance of Dr. John Torrey, made in boyhood, laid the foundation of Mr. Lyon's taste for the study of plants, which, after his removal to California in 1871, he was able at length fully to gratify. In 1884 and 1885 he explored the little known island of Santa Catalina, one of the San Bernardino group, discovering several undescribed species of plants, and making useful observations on the character and distribution of its peculiar flora. Under the title of *A Flora of our Southwestern Archipelago*, Mr. Lyon published, in 1886, the scientific results of these journeys in the eleventh volume of the *Botanical Gazette*.

LYONOTHAMNUS FLORIBUNDUS.

Iron Wood.

Lyonothamnus floribundus, Gray, *Proc. Am. Acad.* ser. 2, xii. 292. — T. S. Brandegee, *Zoë*, i. 111, 136, t. 4.

Lyonothamnus asplenifolius, Greene, *Bull. Cal. Acad.* i. 187; ii. 149, 397, t. 6. — T. S. Brandegee, *Proc. Cal. Acad.* ser. 2, i. 210. — Sargent, *Garden and Forest*, ii. 435.

Lyonothamnus floribundus, var. **asplenifolius**, T. S. Brandegee, *Zoë*, i. 136.

A bushy tree, rarely thirty to forty feet in height, with a single trunk sometimes eight or ten inches in diameter, but usually with a number of tall stems rising from the ground; or, in exposed situations, reduced to a low shrub. The bark of the trunk is a third of an inch thick and dark red-brown, and is composed of many thin papery layers, five or six of which, after partially separating, remain on the stem broken into long loose strips. The branchlets are at first pale orange-color and, like the branches of the inflorescence, are coated with pubescence which soon disappears, and at the end of their first season they are bright red and lustrous. The leaves, which vary from four to eight inches in length and from half an inch in width when entire to four inches when pinnately divided, are coated on the lower surface, when they unfold, with thick white deciduous tomentum, and are dark green and rather lustrous on the upper surface, and yellow-green, glabrous, or pubescent on the lower, with orange-colored midribs. The inflorescence, which appears in June and July, varies from four to eight inches across, the individual flowers being from an eighth to a quarter of an inch in diameter. The fruit ripens in August and September, and is three sixteenths of an inch long.[1]

Lyonothamnus floribundus is known only on the islands of Santa Catalina and Santa Cruz off the coast of California, where it is found growing in dry rocky soil on the steep slopes of cañons. It is most abundant on Santa Cruz, where many fine groves exist on the northern shore of the island, and where it attains its largest size. On Santa Catalina it is much smaller, rarely arborescent in habit, and usually produces simple or sinuate or lobulate leaves.

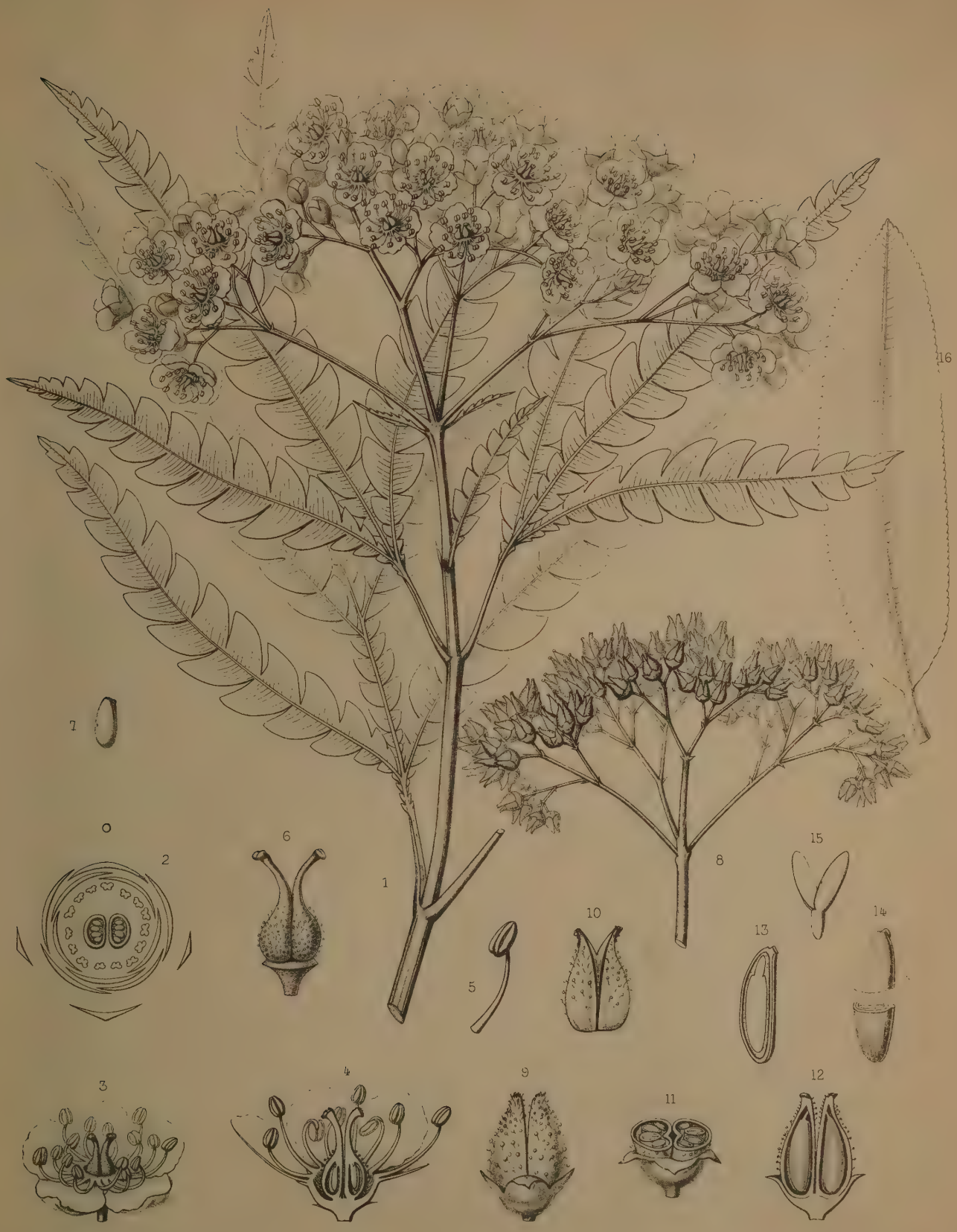
Lyonothamnus floribundus is an interesting and handsome plant. It is the only North American representative of its family which attains the size and habit of a tree. The beauty of its multiform persistent leaves, and the ample size and abundance of its clusters of flowers, will cause it to be valued as an ornament in the gardens of temperate countries.

[1] Plants of Lyonothamnus with simple leaves and with pinnately divided leaves appear distinct, but on Santa Catalina trees were found by Mr. T. S. Brandegee on which both the narrow simple leaves and the divided leaves of all the different forms occurred, and his conclusion that the plants of Santa Catalina and of Santa Cruz are merely heterophyllous forms of one species is doubtless correct (*Zoë*, i. 111).

EXPLANATION OF THE PLATE.

PLATE CXCVII. LYONOTHAMNUS FLORIBUNDUS.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. A stamen, enlarged.
6. A gynœcium, enlarged.
7. An ovule, much magnified.
8. A cluster of fruit, natural size.
9. A fruit, enlarged.
10. Ventral view of an open carpel, enlarged.
11. Cross section of a fruit, enlarged.
12. Vertical section of a fruit, enlarged.
13. Vertical section of a seed, enlarged.
14. A seed divided transversely, enlarged.
15. An embryo, much magnified.
16. A simple leaf, natural size.



C.E.Faxon del. Picart fr. sc.

LYONOTHAMNUS FLORIBUNDUS, Gray.

A. Riocreux direx.t Imp R. Taneur, Paris.

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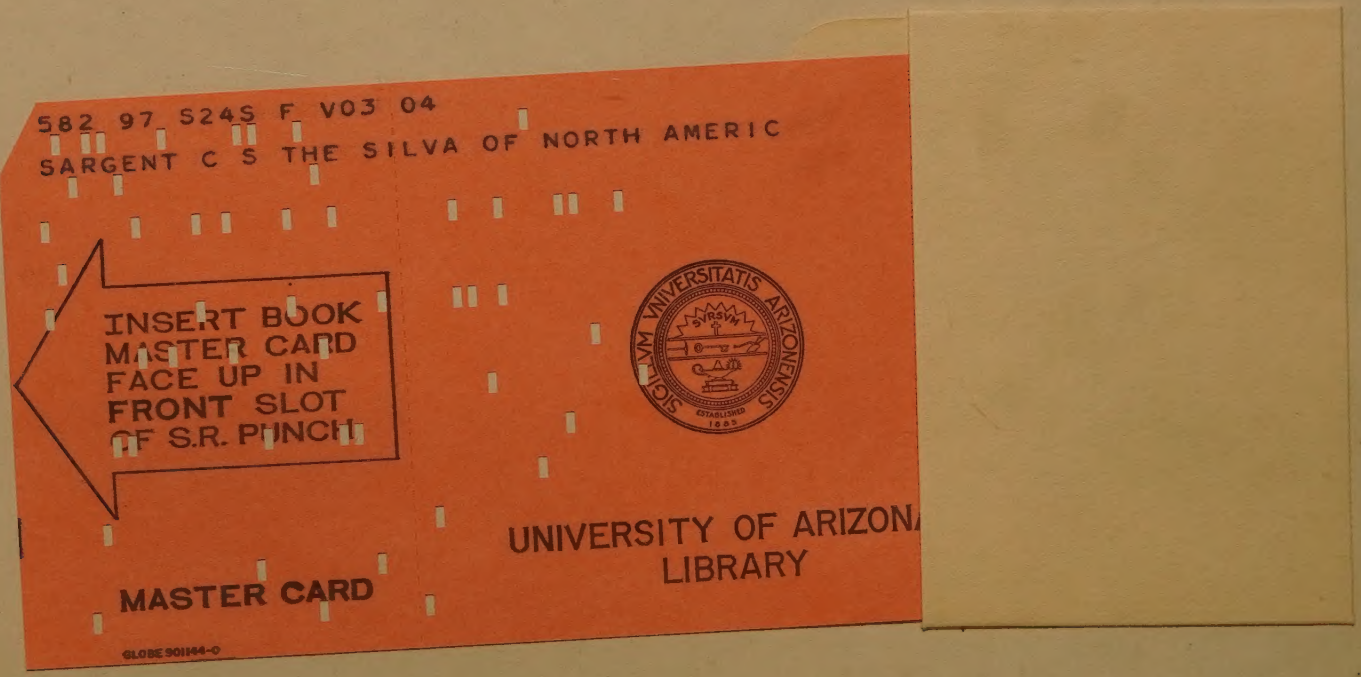
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